A DESCRIPTIVE CASE STUDY INVESTIGATION INTO TEACHER'S LEVELS OF USE OF THE E CONNECT AND LEARN LAPTOP PROGRAMME AT A SECONDARY SCHOOL IN THE SOUTH EASTERN EDUCATIONAL DISTRICT

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Abstract

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Roberta Phillip

The purpose of this descriptive case study was to investigate how the E Connect and Learn (eCAL) Laptop programme was being implemented within the classroom at Olive Leaf High School. Towards this end, three Computer Studies teachers who utilise the devices within the classroom were the main participants of the study. To fulfil the purpose of the study, data was collected using three methods, a levels of use (LoU) focused interview, classroom observations and document analysis. Results from the data collection exercise were analysed and categorised using the LoU behavioural categories and decision points. Results of data analysis revealed that the form one and form two teachers were experiencing "routine use" with the programme, while the form three teacher was experiencing "mechanical use" with the programme within the classroom. Findings revealed that four factors (logistical and infrastructural problems, a lack of external collaboration, a lack of support and warranty limitations) were contributing to this variation in overall LoU by the teachers. A thorough understanding of LoU can aid the change process and enable change facilitators (Curriculum Officers, Principals, and Teachers) to measure the extent of implementation within the school so that suitable interventions can be created to facilitate sustained and widespread integrated use of the eCAL laptop programme by teachers at Olive Leaf High School.

Keywords: LoU, Concerns Based Adoption Model (CBAM), E Connect and Learn (eCAL) Laptop Programme

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Chapter 1

Background to the study

In September 2010, the Ministry of Education (MOE) launched the E Connect and Learn (eCAL) Laptop programme for students entering form one, "having successfully completed the Secondary School Assessment (SEA) examinations" (eCAL Policy Document, p. 1). During the 2010/2011 academic year, Olive Leaf High School received one hundred and ten (110) laptop computers as part of the initial programme roll-out. The policy document outlined that monitoring of laptop use by teachers falls under the direct responsibility of School Supervisors II and III, Curriculum Officers, Principals and Head of Departments. At present, the laptops are used in varying degrees within the school by teachers in the following curricular areas, Technology Education, Computer Studies and Art.

As part of this monitoring process, the Information and Communication Technology (ICT) Technician was directed to conduct an audit of the programme on behalf of the School Supervisor III during the month of February, 2014. The audit revealed that since the inception of the programme, four years ago, the school has received, three hundred and seventy (370) laptop computers. At present, one hundred and ten (110) laptops are not working. The ICT Technician outlined the following problems with the programme within the school: ill use by students, cracked screens, computer viruses, non-functional keyboards, a lack of student support at the school when hardware and software problems are experienced and little or no electrical supply in some classrooms.

Given the plethora of issues outlined by the ICT Technician, I was interested to find out how teachers were implementing the programme within the classroom. This need to gain a deeper understanding of the issue was borne out of my own struggles to implement technology

within the classroom. I have been working at the school for the past thirteen years, initially as a Typewriting/Office Procedures teacher and now as an Electronic Document Preparation and Management (EDPM) teacher because the syllabus document was upgraded to reflect an integration of technology. Dealing with this change has been challenging and stressful at times because of a host of logistical problems which includes unavailability of internet access, out dated software, non-functional equipment, lack of technical support and a lack of networked facilities within the school.

The school currently has two computer laboratories and one Audio Visual (AV) room. One of the laboratories is utilised by the Business Studies Department for EDPM. The ICT Technician who has direct responsibilities for handling laptop issues within the school also operates out of this laboratory. The other laboratory is shared between three (3) Computer Studies teachers who belong to the Maths/Science Department. Through informal conversations, these teachers have expressed their views that timetabling arrangements usually create clashes which impact the use of the computer laboratory. To mediate these clashes, the teachers have begun using the AV room as an alternate space. However, use of the AV room is contingent upon a booking system. While teachers agreed that the devices can be utilised within the classroom, inefficient access to multimedia equipment, internet access and networking issues are creating problems that impede the delivery of the curriculum and use of the devices.

When consulted about the issues raised by the teachers, the ICT Technician indicated that that most of the multimedia equipment were stolen during a burglary which occurred during the 2010/2011 academic year. Additionally, he explained that, the network server which supplies internet access over the Wide Area Network (WAN) has been inoperable for the last three (3) years because of a problem with "over-condensation" of the air condition unit. Consequently,

the one remaining projector is shared among the staff which consists of forty-three (43) teachers and internet access to the Local Area Network (LAN) which is located within the administrative office at the school is limited. The above limitations as highlighted by the teachers and ICT Technician provided additional justification for my interest in the issue.

Lei & Zhao (2008) contend that although there has been considerable increase in the number of one to one computing evaluation and research studies (Lei, Conway, & Zhao, 2007; Penuel 2006 as cited in Lei and Zhao, 2008), the emphasis of these studies mainly focus on two areas: the implementation of one to one computing programmes and the impact of one to one computing programmes. There is little research that focuses on how laptops are being used for teaching and learning in environments with one to one computing (Bebell 2005 as cited in Lei and Zhao, 2008). Thus, some understanding and insight into how teachers implement the laptops within the classroom for teaching and learning, given the issues identified above, is seen as valuable.

Additionally, a dearth of research exists on how the laptops are used for teaching and learning. Lei & Zhao (2008) claimed that "when it comes to the question of what really happens when every child has a laptop and how the laptops are being used in classrooms, studies (Penuel, 2006; Hill & Reeves, 2004; Silvernail & Lane, 2004 and Stevenson, 1999) provide only general information on "what" is used, "how much" is used and the changes in "what" and "how much", but not much information on "how" the laptops are being used in teaching and learning practices. Research conducted by Donovan, Hartley, & Strudler, (2007) suggested that while some would argue that the introduction of technology into schools changed education, others would suggest that the appearance of the classroom changed, but many of the activities remain the same.

Within the region, a survey of one to one computing programs in Latin America and the Caribbean conducted by Severin and Capota (2011) on behalf of the Inter American Development Bank is telling much of the same story. While the report details the rationales and desired impact for implementing one to one computing programs, it reveals little in terms of how these programs are being implemented within the classroom. Reports on monitoring and evaluation of such programmes reveal that students tend to use the laptops mostly for writing and internet browsing when connectivity is available. The authors indicate that "to date, the results of implementation and impact of these programs are not conclusive as short implementation time, little and or limited evaluations coupled with a lack of appropriate instruments are hindering deeper understanding of these initiatives" (p.55).

At the national level, the Curriculum Planning and Development Division (CPDD, 2011), conducted a Phase 1 survey of the eCAL programme to provide a snapshot of what has transpired since the inception of the programme. Results from the survey indicated that "the total usage of laptops within instruction is less than twenty-five percent, while usage out of school is estimated to be more than seventy percent" (Salandy, 2011, p. 8). Additionally, an article written in the Trinidad Express has described the implementation of the programme within schools as a 'nightmare'. The reporter noted that "some students were using the laptops to play games, while administrators reported numerous problems (incorporating the laptops into education curriculum, a lack of adequate training for teachers, inconsistencies in the way the laptops were being utilised in various schools to enhance learning outcomes and infrastructural issues) which hindered effective implementation of the initiative" (Allaham, 2011, p. 2).

I believe that the foregoing viewpoints on the programme thus far have highlighted that a gap exists within the literature as it relates to Levels of Use (LoU) of one to one computing

programmes. Therefore, a thorough investigation of the implementation of the eCAL programme within the school should enable change facilitators to assess the extent to which teachers of Computer Studies are progressing with the implementation of the programme within the school.

Statement of the problem

The eCAL Laptop Programme is inundated with numerous barriers to implementation within the school as alluded to earlier in the chapter. Ellsworth (2000) claimed that historically, change has often been treated as an event rather than a process. He contends that "even with the aid of a clear process description, administrators and policy makers are frequently left without any empirical framework that will show whether, and to what extent, their policies have been implemented in the classroom" (p 150). The LoU diagnostic tool fills this gap, offering a rigorous way to describe the change process which provides answers for decision makers' need for accountability (Hall and Hord, 1987, p. 103 as cited in Ellsworth, 2000). The viewpoint is further clarified by Hall (2010) who explained that "rather than being dichotomous (use or non-use), change process researchers have established that there are different LoU which can be used to describe the current state of each implementer" (p 236). I believe that there is a need for research to be conducted in this area to ascertain the current LoU being experienced by teachers of Computer Studies given the existing barriers to implementation.

Purpose of the study

The purpose of this descriptive case study was to investigate how the eCAL laptop programme is being implemented within the classroom at Olive Leaf High School. The researcher believes that the findings from this research can be used diagnostically to create interventions which can be used to help teachers progress to a more advanced LoU with the technological innovation within the classroom.

Research Questions

The research was guided by the following research questions:

1. How would teachers of Computer Studies teachers describe their LoUof the eCAL laptop programme within the classroom at OLHS? (To be operationalised)
2. What are some of the needs expressed by teachers of Computer Studies which might allow them to move to higher LoU?

Expected outcomes

Given the challenges at the level of the school, it is envisaged that an in-depth analysis of the LoU of the eCAL laptop programme at Olive Leaf High School will:

1. Offer an in-depth understanding of the possible challenges and issues that may arise within a one to one computing class;
2. Provide a sound understanding of the learning practices being utilised within the Computer Studies classroom;
3. Provide an opportunity for the needs of teachers of Computer Studies to be highlighted so that appropriate facilitation measures can be created.

3. Provide stakeholders (school administrators, teachers and Ministry of Education officials) with valuable information to determine sustainability of the over the long term.

Summary

This study was designed to investigate how teachers of Computer Studies are implementing the eCAL laptop programme within the classroom. Informal conversations have revealed that numerous barriers to implementation exists within the school. Research indicated that while there have been considerable increase in the number of one to one computing evaluations and research studies over the years, little information exists on how the laptops are being used in teaching and learning. It is believed that an examination of LoU will allow the researcher to answer the research question and provide an understanding of the change process occurring within the school in relation to the programme. Chapter 2 will attempt to ground the research within a theoretical framework and explore issues which might shed light on the phenomenon occurring within the school.

Chapter 2

Literature Review

In this chapter, the researcher examined literature with respect to use of technological innovations within the classroom with a view to providing a theoretical framework for the study. This framework would be guided by one diagnostic tool (the Levels of Use of the Innovation) which is taken from the Concerns Based Adoption Model (CBAM). According to Dirksen & Tharp (1997) CBAM was developed by the staff members of the Research and Development Center for Teacher Education at the University of Texas. The authors further explained that the model addresses three assumptions:

1. The individual's concerns about the innovation (Stages of Concerns);
2. The particular manner in which the innovation is delivered or implemented (LoU); and
3. The adaptation of the innovation to the individual through three diagnostic dimensions (Innovation Configuration).

The researcher will focus on the second assumption in an attempt to understand how LoU eCAL programme was being implemented within the classroom. According to Hall et al. (1987) LoU maps the adopter's behavioural progress in putting the innovation into practice. The LoU dimension describes "behaviours of innovation users and does not at all focus on attitudinal, motivational, or other affective aspects of the user" (Hall & Hord, 2006, p. 159). The assessment tool does not attempt to explain causality but instead provides a framework to define operationally what the user is doing. Therefore, if change facilitators gain an understanding of how teachers of Computers Studies are implementing the programme they would be better able to provide support to aid the change process.

Hord, Rutherford, Huling-Austin, and Hall (1987) claimed that a "prime responsibility of change facilitators is to guide the change process to a point of successful implementation" (p 54). In order to accomplish this, the facilitator must monitor how an innovation is being used and act upon that information. Appendix A, details the eight distinct LoU which have been created by Loucks, Newlove, & Hall, 1975 as cited in Hall, & Hord, 2006, p.160. Each level encompasses a range of behaviours, but is limited by a decision point that denotes actions that move the individual to the next level (Hord et al., 1987). Ellsworth (2000) posited that historically change has often been treated as an event rather than a process. He explained that "even with the aid of a clear process description, administrators and policy makers are frequently left without any empirical framework that will show whether, and to what extent, their policies have been implemented in the classroom" (p. 150). The LoU fills this gap by offering a rigorous way to describe the change process so that decision makers need for accountability are answered (Hall, & Hord, 1987, p. 103 as cited in Ellsworth, 2000).

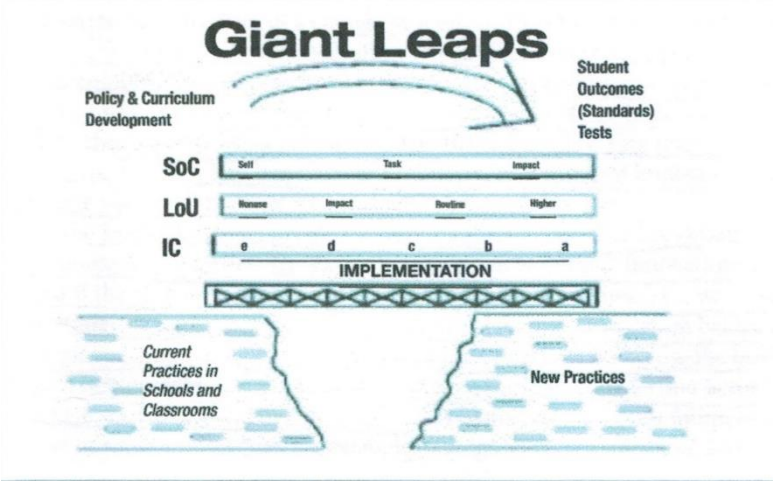
According to the eCAL policy document the Principal is responsible for conducting and recording monthly checks on the status of laptops, frequency of use by teachers, incidents, repairs and/or loss. The researcher believes that if the Principal has an in-depth understanding of teachers of Computer Studies LoU, he or she will be in a better position to complete the schools monthly laptop return form and provide teachers with the necessary facilitating conditions to aid the change process within the school. The remaining sections of this chapter will be organized into three specific areas of research which will shed light into how LoU impacts the change process. These areas are as follows: (i) the implementation bridge and LoU (ii) conditions for laptop use in school; and (iii) LoU and the facilitation of change.

The Implementation Bridge and LoU

> Goopeesingh (2010) opines that "when the eCAL laptop programme is fully up and running, "little Harry in form one comes into the classroom with his laptop. Teacher Stacy tells the class to turn on their machines, and check the internet for information about the day's Science and Civics lesson by googling the subject "FLOODS". Students begin exploring various links, and soon there is a discussion about all the material being found. Miss Stacy takes questions and leads the children to answers, then assigns students to write an essay about the topic, using the research conducted" (Ministry of Education, Official Laptop Information, 2010, p.1).

The eCAL policy document outlined that the use of ICT expands and enhances teacher practice as teachers are now required to design learning experiences that access wireless learning technologies and diversify classroom practices as is evident in the excerpt above. However, Hall et al. (1987) suggested that "one of the most common and serious mistakes administrators and change facilitators make is to presume that once an innovation has been introduced and initial training has been completed, the intended users will put it into practice" (p. 56). Hall & Hord (2006) argued that in order for change to be successful, change facilitators must utilise a measurement tool that would allow them to assess the extent of implementation. The "implementation bridge" metaphor is one such tool created by Hall & Hord (2006). The bridge allows change facilitators to measure current practices against new practices, with a view to determining the impacts and outcomes derived from the implementation (Figure 1).

Figure 1: The Implementation Bridge



Source: Hall, G.E (2010) Technology's Achilles Heel: Achieving High Quality Implementation, p. 234.

The three rows on top of the implementation bridge in Figure 1, represent the three Diagnostic Dimensions (Stages of Concerns, LoU and Innovation Configuration) of the Concerns Based Adoption Model (CBAM) which can be used to measure users progress over the bridge. Without an implementation bridge, there is little reason to expect positive change in outcomes. Instead, Hall (2010) contended that "there are likely to be causalities as individuals attempt to make the giant leap from current practice to new practice" (p. 234). For the purpose of this study, the LoU diagnostic tool is being utilised to measure how teachers of Computer Studies are implementing the eCAL laptop programme within the classroom at Olive Leaf High School. This diagnostic tool would be used to describe the current state of each implementer, in relation to how they are progressing with the programme within the classroom.

Hall (2010) posited that "regardless of the potential promise of any technology innovation, specialized effort is needed to assure widespread and effective use" (p. 235). An important starting point is accepting as fact that different implementers are not likely to

use the technology exactly from classroom to classroom (Hall, 2010). As such, it is suggested that as an innovation is disseminated each prospective user should ask four simple questions: (i) is it being used? (ii) how well is it being used? (iii) what factors are affecting its use/nonuse? and (iv) what are the outcomes? These questions are an important starting point for change facilitators who would seek to determine the extent of use post implementation. As a matter of fact, in January 2011, the Curriculum Planning and Development Division (CPDD) presented results of a Phase I survey of the eCAL laptop programme. The survey examined the use of laptops in schools and the challenges faced in Phase 1 of the implementation. Results revealed that "a host of challenges was impeding implementers' progress with the innovation and total usage of laptops within instruction is less than 25%" (Salandy, 2011, p. 5). Given the results of the report, it is not surprising to learn that when the perspective of an implementation bridge is employed, outcomes can be expected to vary with how far across the bridge each implementer has progressed (Hall, & Hord 2006). Additionally, the results indicated that usage of laptops within school was low. Thus, it is important to determine if these outcomes are being experienced within OLHS.

According to the eCAL policy document, the laptop is "intended for use as an instructional tool, curriculum tool and for research and communication" (p. 6). If used as intended, given the implementation bridge metaphor, change facilitators can expect to see an increase in outcomes within the classroom. The researcher believes that combining the LoU diagnostic tool with the implementation bridge metaphor will allow for a more accurate assessment of how the implementation is progressing within the classroom. Hall et al. (1987) opined that when change facilitators employ the implementation bridge

metaphor as part of the change process they are better able to assess how far across the bridge each implementer has progressed and use these findings to create suitable interventions to guide users to higher LoU.

Conditions for laptop use in schools

An examination of the eCAL policy document revealed little in terms of conditions for laptop use in schools. In general, the scope of the policy as outlined on p. 2, identified that the policy applies to the use of hardware (computer equipment and peripherals) and software (a collection of computer programs, and documentation that perform some task on the operating system to run the hardware), operations, repair, maintenance, upgrades and replacement thereof, as well as, technology resources (network, internet electronic mail, digital images and new technologies as they become available). Research also revealed that the Trinidad and Tobago Computer Society, presented a paper entitled "Laptops in Schools Programme" in June (2010), which outlined issues to consider when implementing laptops in schools. However, results of the CPDD, Phase 1 laptop survey report revealed that a host of challenges (network, internet bandwidth, infrastructure, electrical outlets) was creating variance amongst schools in that phase of the implementation (Salandy, 2011). Moreover, these challenges as identified within the report are similar in nature to the audit conducted in February, 2014 at OLHS.

The issue of sustainability of the programme comes into question given the range of issues being experienced within the school. If these issues are not mediated in a timely fashion, then the technological sustainability of the programme will be hampered over the long term. According to the eCAL policy document, technological sustainability involves choosing technology and designing an integrated technical architecture to use it efficiently and

economically over the long term" (p. 5). The researcher believes that a lack of the necessary facilitating conditions within the school can severely curtail usage will ultimately impact on the technological sustainability of the programme. Lei, Conway & Zhao (2008) opined that for laptops to have an impact within the classroom various elements must be present, for example, resources, time, money, technical support, peripheral technologies (such as internet connections, printers, projectors and software programs), a supportive environment, and interactions with people – teachers and students, so that the laptop use can take root and spread. If these conditions are not met two major measures essential to the survival and prosperity of technology use in schools will be affected, "the quantity of technology use" and "the quality of technology use" (Lei, & Zhao, 2008, p. 101). Without the necessary facilitating conditions, laptops can hardly, function at either the quantity level or the quality level (Lei et al. 2008).

The MOE Draft Administrative Report 2011-2012, reporting on the assessment of the eCAL programme revealed that the infrastructure at some schools needed to be expanded to allow for increase accessibility to the internet within the classroom. Penuel (2006) indicated that technical infrastructure including the availability of support for addressing problems as they arise is a significant factor in shaping teachers' technology use in the classroom. Additionally, research conducted by Hills & Reeves, 2004; Tatar, Roschelle, Vahey, & Penuel, 2003 have revealed that for classrooms using wireless networks, the reliability of the network is frequently an issue and a barrier to widespread use by teachers for instruction. Given the foregoing, it can be deduced, that there is a need to understand the conditions that are impacting use to enable change facilitators to find feasible solutions to overcome these barriers. Stansbury (2011) have indicated that a key to overcoming logistical issues is to provide the necessary technological

infrastructure (network, electricity, wireless plan) to ensure sustainability of one to one computing programmes.

The Trinidad and Tobago, Computer Society Report, 2010 have indicated that servicing and support is a key criteria for laptop sustainability in schools. The reported detailed that the most common warranty period for a laptop is one to three years. An examination of the eCAL document revealed that students would be given a one year warranty on parts and service. This limitation on warranty ultimately will affect technological sustainability for persons who use the devices within upper forms at the school. Alberta, School Technology Sector (2010) have indicated that in the second and third years Emerge programs were beginning to experience some equipment failure associated with laptops and battery life. Thus, there is confirmatory evidence which suggests, that conditions for use is not just limited to logistical and infrastructural issues but extends to the amount of warranty that is given on the devices.

Research conducted by Molina, Sussex & Penuel (2005) revealed that even when access to computers and wireless connectivity is sufficient, perceptions among teachers that there is limited access to timely technical support from school-based or district staff can hinder their use of technology within the curriculum. There is only one way to make the idea of one to one computing work, that is, teachers and students must use the laptops within the classroom (Lei, Conway & Zhao 2008). If the conditions for use are not present then long term sustainability of the programme as well as levels of use will be impacted. Deeper investigation is needed to ascertain how the conditions within the school are impacting LoU of teachers of Computer Studies.

LoU and facilitation of change

Hord et al., (1987) indicated that the LoU dimension of the CBAM offers information that can be of great assistance to any change facilitator. However, if ignored, LoU will take its own course, that might well be counterproductive to the intended outcomes of an innovation.

By determining as estimate of overall LoU change facilitators (Curriculum Officers, Principals, and School Supervisors) can create suitable intervention which can aid the change process. Hall and Hord (2006) claimed that each person's LoU and success with change is in large measure influenced by the facilitation he or she receives. In the author's viewpoint, "If no support and facilitating interventions are offered, many will never fully implement the innovation, and others will remain non-users or at lower LoU" (p. 171). The importance of professional development as a facilitation measure cannot be overstated in this regard, because when teachers are not prepared to use new technology, computers end up being just souped-up typewriters (Cuban, 2001 as cited in Lei et al., 2008). Research conducted by the National Center for Education Statistics (NCES), 2000 reported that the amount of professional development that teachers have received has been found to be related to teachers' feelings of preparedness to use technology with students. Additionally, CPDD survey recommended that training should be completed in the use of a variety of strategies for infusing/integrating ICT technology into the curriculum; for developing subject-related ICT resources; for providing teachers with skills related to classroom teaching, and methods of using the computers/laptop/internet to infuse or integrate ICT into every subject.

In support of the above recommendations, the MOE embarked on a series of ICT training initiatives for teachers. The first of these was geared towards form one teachers and was conducted in 2010. In 2012, the Ministry launched the ICT in Education Innovative Award

along with the eCAL Annual Student ICT competition to supplement the laptop programme and aid in the development of 21st Century Skills. In 2013, two sensitization workshops were launched "Using ICT tools in the delivery of the curriculum" and "Online Workshop for Teachers in the area of ICT Integration in teaching and learning" to further aid teachers in effective use of the devices. To my knowledge, teachers at the school have only participated in the first workshop. Thus two issues remain unclear at this time, whether or not teachers at the school have participated in any of the workshops and the degree of success that these facilitating programmes have provided with implementation of the programme within the school.

The eCAL policy document stipulated that results based monitoring will occur during all phases of implementation and a formal monitoring and review will be conducted annually in order to determine whether the policy is relevant and if amendments are needed due to changing GoRTT/MOE policies, procedures or changes in the technology. However, to date only one documented report exists which details the status of the implementation in 2011. There is a needed therefore for additional research to be conducted in this area to aid the monitoring and evaluation process as outlined in the eCAL Implementation Plan (2010). Hord et al., (1987) posited that while many factors may influence a person's LoU, the most powerful influence is the manner in which the implementation effort is facilitated at the level of the school. As the strength of any educational initiative depends on its ability to adapt to the process of change. Hall & Hord (2006) claimed that this is especially true in an area like technology where changes happen quickly, often to be abandoned in favour of the next big thing. The researcher believes that a deeper understanding of LoU of the initiative within the school would enable change facilitators to gain a deeper understanding of what is occurring within the school.

Summary

The literature have highlighted that LoU can be used to assess the behaviour of implementers using technological innovations. Once an overall rating for LoU is achieved, change facilitators can used this information diagnostically to measure the extent of implementation. However, in order for any change to be successful certain conditions must be present within the school to help teachers move across the implementation bridge. Additionally, change facilitators must play an active role in monitoring and evaluating the change process so that sustainable interventions can be created to support long term use of the programme. In Chapter 3, the researcher outlines the methodological decisions that was employed during the research process.

Chapter 3

Methodology

Type of study

The issues explored in Chapter 2 above highlighted the need for deeper research into LoU. It is believed that results from this research would allow stakeholders to gain insights into how the implementation was progressing given the finding of the Phase 1 laptop survey which reported total usage of laptops within instruction to be less than 25% (Salandy, 2011). According to the literature, the main factors which accounted for such low usage during the Phase 1 laptop survey are poor technological and infrastructural conditions within the schools, as well as, a lack of training which can promote deeper usage by teachers. Based on the foregoing, the purpose of this descriptive case study was to investigate how the eCAL laptop programme is being implemented within the classroom at Olive Leaf High School (OLHS). Two research questions were developed but only the first question was operationalised given the parameters of the research project. The research questions are listed below.

1. How would teachers of Computer Studies describe their LoU of the eCAL laptop programme within the classroom at OLHS? (to be operationalised)
2. What are some of the needs expressed by teachers of Computer Studies which might allow them to move to higher LoU?

The study falls under the qualitative framework because the researcher sought to discover the subjective meaning (Johnson and Christensen, 2012; Domegan and Fleming, 2007) that the implementation of the programme held for teachers of Computer Studies within the school. Additionally, Denzin and Lincoln (2003) explained that qualitative research involves an interpretative, naturalistic approach to its subjective mater as it attempts to make sense of, or

interpret phenomenon. In this regard, the researcher will strive to collect information about the eCAL laptop programme which would facilitate an interpretation of the phenomenon with a view to shedding light on how the implementation is progressing within the school.

Qualitative research is described as naturalistic (Denzin & Lincoln, 2003; Merriam, 2009; Yin, 2003) because it attempts to study the everyday life of people in their natural setting. In keeping with the naturalistic the study was conducted in a Secondary school in Central Trinidad. The researcher, an EDPM teacher in the school and the main instrument of data collection hoped to gain a better understanding of the particular context within which the participants act and sought to comprehend the influence that this context have on their actions with the programme as postulated by Myers (2009). The study is therefore informed by the ontological position that multiple truths and multiple realities exists (Lincoln & Guba, 1985; Denzin & Lincoln, 2003; Merriam, 2009). Thus the study is conducted with the intent of understanding and reporting these multiple realities and truths by relying on the voices and interpretations of informants though extensive quotes, presenting themes that reflect words used by informants and advancing evidence of different perspectives on each theme as recommended by Creswell (2007).

From an epistemological perspective, the researcher acknowledges that what people perceive and believe is shaped by their assumptions and prior experiences as well as by the reality they interact with (Maxwell, 2013). The key concern according to Merriam (2009) is understanding the phenomenon of interest from the participants' perspectives, not the researcher's. In this regard, the researcher, being the primary instrument of data collection will seek to construct knowledge from the meanings and responses obtained from in-depth interviews, classroom observations and document analysis. Merriam (2009) opined that bits and pieces of information from interviews, observations or documents are combined and ordered into

larger themes as the researcher works from the particular to the general. The researcher believes that this data collection process will aid in the presentation of rich, thick descriptions (Merriam, 2009; Creswell, 1998; Maxwell, 2013) which will be used to describe how the eCAL laptop programme is being implemented within the classroom at Olive Leaf High School.

Finally, this case study embraced the rhetorical assumption that the writing will be personal and literary in form instead of using quantitative terms such as "internal validity", "external validity", "generalizability", and "objectivity" (Denzin & Lincoln, 2003; Merriam, 2009; Lincoln & Guba, 1985). As a consequence, the researcher writing this case study employed terms such as "credibility", "transferability", "dependability", and "confirmability" (Guba & Lincoln 1985). According to Creswell (2007), seldom does one see an extensive "definition of terms" section in a qualitative study, because the terms as defined by participants are of primary importance.

Research design

The research design selected is a descriptive case study (Merriam, 2009). According to Hancock and Algozzine (2011) descriptive designs attempt to present a complete description of a phenomenon within its context. Merriam (1998) asserted that a descriptive case study is one that presents a detailed account of the phenomenon under study and is useful for investigating innovative programs and practices. This design was selected because it focuses on a "single unit" or a bounded system (Merriam 1998; Yin, 2003; Stake, 1995). "Boundedness" according to Merriam can be determined by asking "whether there is a limit to the number of people involved who could be interviewed or a finite amount of time for observation…" (p. 27-28). As such, three teachers of Computer Studies will be the main focus of the study. Additionally, the

case study is chosen as an appropriate research method when it is difficult to separate the phenomenon under study from the context (Yin, 2003). The phenomenon under study is therefore examined within an educational setting.

Hancock & Algozzine (2011) noted that case study design and approaches can be chosen based on their type, characteristics or disciplinary orientation. Therefore the researchers' selection of the research design is determined by how well it allows for full investigation of the research question. Yin (1988) indicated that the case study investigator's aim is to re-tell the story from the participants' point of view. In this regard, the researchers' main data collection strategy would be a LoU (focused interview). Information gained from this interview would be triangulated with classroom observations and document analysis to confirm findings and facilitate the credibility of the data collection exercise. The case study, although it can also be used in quantitative investigation, is in keeping with the qualitative methods as it retains a holistic approach to the investigation of the phenomenon (Yin, 2003).

Sampling design and procedures

Purposeful sampling was utilized to select participants for the study. This type of sampling involves the selection of participants who have key knowledge or information related to the purpose of the study (Lincoln and Denzin, 2005). As mentioned in chapter one, the laptops are used in varying degrees by different curricular areas. However, the researcher selected three teachers of Computer Studies from the Maths/Science Department. The focus on Computer Studies teachers arose out of their pre-existing usage of desktop computers within the learning environment, their educational background in the field of information technology and the fact that they all teach ICT to students within both the lower and upper levels of the school. Of the

three teachers selected Cindy has been working at the school for the past fourteen years and currently teach Information Technology and Computer Studies to students within both upper and lower forms but has had no teacher training to date. Maria has been teaching Computer Studies for the past ten years and currently teach Information Technology, Mathematics, Add Maths, Cape Maths Unit 1 and Unit 2. She is also teacher trained. Christine has been teaching for the past seven years and currently teach Information Technology and Computer Studies. She is not teacher trained. It is believed that participants with these characteristics will be able to purposefully inform an understanding of the research problem and add to the richness of the data collection exercise.

Methods of data collection

Research (Merriam 2009; Creswell, 2007; Maxwell, 2013; Denzin & Lincoln, 2005) indicates that qualitative researchers use more than one method of data collection in the same study and compare the results obtained through these multiple methods. This process is known as triangulation, and adds thoroughness, richness and depth of understanding to the study (Denzin and Lincoln, 2005; Merriam, 2009). In addition to using the LoU diagnostic tool (see Appendix A) from CBAM, the researcher also conducted document analysis and two classroom observations using codes borrowed from the LoU diagnostic tool. Hall et al. (1987) opined that "people who seek information for the purpose of guiding the implementation of change, can use a combination of observations and informal questioning to get the information needed to determine LoU" (p. 56).

Data will be collected in two stages in order to answer the research question. During stage one, the teachers were interviewed using the LoU interview protocol (Appendix B) to

ascertain their behavioural progress with the programme within the classroom. As noted earlier, the LoU Dimension describes the behaviours of users of an innovation through various stages and behavioural categories (see Appendix A and E). The interview process begun with the researcher asking in an open-ended way whether the interviewee sees herself as a user or non-user of the innovation. Once it is established that the person is or is not a user of the innovation, the appropriate branches are followed and the appropriate LoU interview questions must be asked (Hall, Dirksen and George, 2006). The basic interview protocol is presented in Appendix B and the branching format is presented in Appendix C.

Data collection efforts in stage two sought to examine the in-class and out-of-class behaviours associated with using the eCAL laptop programme. Hall, Dirksen & George (2006) opined that use behaviour of a teacher who is implementing a new instructional strategy or programme are not limited to the part of the class day when the lesson is delivered to students. As such, classroom observations was utilised to capture the in-class behaviour of the teacher implementing the programme. Teachers were observed within the classroom using an observation protocol (see Appendix D). The researcher created the protocol to capture observable behaviour in the performing (Pe) category and used decision points (DP) to establish the level of performance which was being observed. This protocol was created using codes which were borrowed from the LoU behavioural categories (Appendix E) and the LoU with decision points (Appendix A). Two observations were undertaken to confirm use of the programme within the classroom. Lastly, schemes of works were analysed using codes borrowed from Appendix A and Appendix E to capture the out-of-class behaviour of the teachers implementing the programme. The researcher engaged in content analysis of the document to highlight instances of performance (Pe) and assessment (As). The overall document was coded

to reflect the planning (Pl) category and decision point (D1-IVA) was assigned to reflect the fact that the document was used routinely by teachers.

Ethical considerations

This being a qualitative study, the researcher had to interact deeply with the participants to collect data. Silverman (2000) noted that researchers should always remember that while they are doing their research, they are in actual fact entering the private spaces of their participants. Creswell (2003) and Miles & Huberman (1994) opined that the researcher has an obligation to respect the rights, needs, values and desires of the informants. The following describes how the researcher adhered to ethical issues during the research process.

Prior to the commencement of the data collection exercise the researcher informed the Principal of her intention to conduct research within the school. The Principal sought approval from the District Supervisor and the researcher received a letter (Appendix G) from the MOE granting permission to conduct research. Participants were informed of the purpose and nature of the data collection exercise and were given the opportunity to peruse the letter before data was collected. At this point, the researcher also made it clear to participants that the research was being conducted only for academic purpose and their participation in it was absolutely voluntary. Teachers were assured that confidentiality and anonymity would be maintained through the removal of any identifying characteristics within the research. The researcher utilised pseudonyms to protect the identity of participants. In this regard, the form one teacher is referred to as Christine, the form two teacher as Cindy and the form three teacher as Maria.

Dates for the conduct of the interviews was agreed upon and all interviews were conducted over a three week period. Follow-up interviews were conducted for verification and

confirmation of the data obtained during the initial interviews (Creswell, 2007; Merriam, 2009) as well as for clarification of any issues identified during the transcription and initial analysis of the data. Member checking (Merriam, 2009) was employed with a view to having each participant review the collected data for accuracy and palatability. Multiple data collection strategies (document analysis, a focused interview and classroom observation) was utilized to triangulate the data collection activities as opined by Yin (2003). Additionally, the trustworthiness of the data collection exercise was strengthen though the use of a research journal (Merriam, 2009; Lincoln & Guba, 1985). This journal was utilised to document each stage of the research process. The researcher documented questions and decisions taken and created reflective memos as a means of sorting through the bulk of information encountered during the study. The authentication of findings was therefore enabled through this chapter and its supporting Appendices which allowed the researcher to detail how information was collected and to explain the process employed in data analysis.

Timeline

Preliminary ideas for the study began during November, 2013. The researcher brained stormed multiple ideas and concepts and settled on concerns and LoU as the topic of the research. An exploration of the literature indicated that many researchers had already conducted research into concerns of teachers using one to one computing. I shared this information with my Supervisor and she advised me to examine the literature closely to identify gaps or possible indicators of future research potential. That is when I discovered that LoU was an under researched area of CBAM. Following this insight, the topic was revised in late January and I began to explore related literature in this field in early February. Looking for the literature was

an arduous tasks because limited studies existed which utilised the theoretical framework. Conceptualization of the methodology began in December and changed considerably because LoU came with a prepared interview protocol which I had to learn. Data collection started in April and rolled into May because of the Easter vacation. Each interview lasted thirty minutes. Short follow up interviews were conducted in May, 2014. Data analysis started in April and continued into May, 2014. Writing of the report started in January, 2014 and the final research paper was presented for submission in July, 2014. Appendix H details the timeline of the study in tabular form.

Methods of data analysis

The researcher utilized the constant comparative method (Glaser and Strauss, 1967 as cited in Merriam, 2009) of data analysis to answer the research question. Yin (2003) emphasized the need for searching the data for patterns which may explain or identify casual links. With this in mind, the researcher transcribed the pre-recorded interviews and openly coded (Strauss and Corbin, 1990) data using "borrowed codes" (Merriam, 2009) from the LoU chart (Appendix A) and the LoU behavioural categories (Appendix E). Each response was compared against the LoU of the innovation (Appendix P) which facilitated assignment of decision points. This process was repeated for all three interviews. The goal was to create descriptive categories that provided a preliminary framework for greater organisation. Support for this approach was provided by Bogdan and Biklen (2003) who outlined that qualitative data analysis involves organising data using a coding process which allows for categorization of emergent patterns and themes. Appendix I, outlines opening coding of the interview data. Follow-up interviews, each lasting five minutes, were conducted during the second week of May, 2014 with a view to

providing verification of the data obtained in the first interview, as well as, to give participants the opportunity to provide deeper explanations of issues that emerged during transcription and preliminary analysis.

Classroom observations captured data about classroom dynamics in real time that could not have been captured during the interview process. The researcher observed two Computer Studies classes, one at the form one level and the other at the form three level using an observation protocol (Appendix D). This protocol was created using one aspect of the behavioural categories (Appendix E), performing (Pe) and decision points. Before the start of the actual observations the selected teachers were informed of the nature of the research and their right to decline to have their classroom observed at any time. Classroom observations lasted 30 minutes and were recorded with the aid of a stop clock. The researcher coded observations (Appendix D) of eCAL use in five minute intervals and memos of classroom activity were recorded to add to the richness of the data collection exercise.

Document analysis (Appendix F) sought to ascertain out-of-class preparatory usage that the teachers engaged in. Towards this end, schemes of work for teachers of Computer Studies, Term II, were analysed using three elements of the seven behavioural categories (Appendix E) namely: planning (Pl), assessing (As) and performing (Pe). The researcher coded the document (see Appendix F) under the planning category (Pl) because it was used as an aid to lesson planning. Once initial codes were assigned for all three data collection instrument, the researcher re-constructed the data (Appendix J) in a tabular format to aid more meaningful analysis and further coding.

During the second stage of data analysis axial coding (Merriam, 2009; Creswell, 2007; Maxwell, 2013) was utilised to derive deeper meaning from the collected data. The initial codes

were compared and contrasted and similar codes were grouped to form categories (Strauss & Corbin, 1990). The emergent data from the interview was then aggregated by questions, behavioural category and decision points. In relation to the classroom observation and document analysis, the emergent data was aggregated according to behavioural categories and decision points. Appendix K, outlines the axial coding process.

During the final stage of data analysis, selective coding (Merriam 2009; Creswell, 2007) was employed to determine overall LoU. Codes from the interview, classroom observation and document analysis were grouped according to the core behavioural categories. These overall behavioural category ratings were then transferred to the LoU rating sheet (Appendix M) to determine each teacher's overall LoU. These emerging categories are of paramount importance as qualitative researchers tend to use inductive analysis. According to Merriam (2009) "the researcher gathers data to build concepts, hypotheses or theories rather than deductively testing hypotheses" (p. 15).

Delimitations to the study

The research was delimited to:

- Three teachers of Computer Studies who utilise laptops which were provided via the eCAL laptop programme.
- Teacher's behaviour during in-class and out-of-class usage of the laptop programme. As such, no focus was placed on concerns that teachers had about the programme.
- Computer studies which is taught to students in form 1-3.
- the study investigated the situation at the researcher's school and no other secondary schools in Trinidad and Tobago.

Limitations of the study

The study is limited to:

- One dimension of the Concerns Based Adoption Model – Levels of Use of the innovation which placed limitations on the conclusions made during the research process.
- Qualitative data analysis because of the research design employed
- Three data collection instruments, namely, a focused interview, classroom observation and document analysis

Summary

The chapter explored the methodological decisions which guided the research process. The research was grounded in the qualitative paradigm to achieve rich descriptions of the phenomenon under study. A descriptive case study was utilised. Data was collected in the form of a focused interview, classroom observations and document analysis from three participants who were purposely selected. Ethical considerations were adhered too during the research process to aid the credibility and trustworthiness of the data collection exercise and parameters were constructed in the form of limitations and delimitations to enable the researcher to better manage the research process. Chapter 4, details the results of data analysis.

Chapter 4

Data Analysis and Presentation of Findings

Data Analysis

The purpose of this descriptive case study was to investigate how the eCAL laptop programme was being implemented within the classroom at Olive Leaf High School (OLHS). In order to answer the research question, three methods of data collection were utilised, namely, a focused interview, classroom observations and document analysis. Data was collected from three teachers of Computer Studies at the above mentioned school in two stages.

The research was guided by the following research questions:

1. How would teachers of Computer Studies teachers their LoU of the eCAL laptop programme within the classroom at OLHS? (To be operationalised)
2. What are some of the needs expressed by teachers of Computer Studies which might allow them to move to higher LoU?

The analysis of data began with the focused interview. I transcribed the pre-recorded interviews and then colour coded the data to reflect LoU with decision points (Appendix A) and the LoU behavioural category (Appendix E). A complete listing of the colour coding scheme is attached as Appendix O. Classroom observations were used to confirm in-class use of the devices, as such only one aspect of the behavioural category was coded, while decision points were utilised to measure the extent to which the teacher was using the devices within the classroom. Document analysis was used to confirm out-of-class preparatory procedures. As such, the document was coded under the following categories: planning, assessing and performing, while decision points were assigned to measure the extent to which the document

was being used by the teachers. Appendix D, F, I and N provide examples of how the raw data was coded, while Appendix J outlines the open codes which were derived from the raw data.

During the second stage of data analysis, axial coding (Merriam, 2009) was successfully carried out. The initial codes were compared and contrasted and similar codes were grouped to form categories (Strauss & Corbin, 1990). The emergent data from the interview was then aggregated by questions, behavioural category and decision points. In relation to the classroom observation and document analysis, the emergent data was aggregated according to behavioural categories and decision point. Appendix K, outlines the axial coding process. During the final stage of data analysis, selective coding was employed to determine overall LoU. Codes from the interview, classroom observation and document analysis were grouped according to the core behavioural categories. These overall behavioural category ratings were then transferred to the LoU rating sheet (Appendix M) to determine each teacher's overall LoU. Results from the data analysis process indicated that Christine and Cindy were experiencing "routine use" with the programme while Maria experienced "mechanical use" with the programme. The factors which accounted for these variations in LoU is presented below according to the seven behavioural categories.

Presentation of Findings

Knowledge

The main purpose of this behavioural category was to determine what the user knows about the characteristics of the innovation. Two questions on the interview protocol were related to this category. Question 1 (a) required users to identify the weaknesses of the innovation. While, question ten, required users to outline the strengths and weaknesses of collaborating. Some of these weaknesses as identified in question 1 (a) are outlined below.

Christine	Cindy	Maria
"internet, the students don't have internet access at school and then at home some do not have internet access either so if the individual has to do further reading or research for projects, etc there is a problem there"	"they not using it the way it should, like for example, they abuse it in terms of playing games and telling their parents that they are doing school work when in fact they are not"	Textbooks in 3L is a problem because they don't have enough resources

On the whole, the teachers reported multiple weakness with the programme stemming from infrastructural and logistical issues. These weaknesses impacted LoU with the innovation within the classroom according to the teachers. In relation to question 10, all interviewees expressed the view, that collaboration facilitated lesson planning, scheduling of classes and preparation of schemes of work. Responses to this behavioural category confirmed that teachers were using the programme and were knowledgeable about the weaknesses in and out of the classroom.

Acquiring Information

At this behavioural category the user solicits information about the innovation in a variety of ways, including: questioning resource persons, corresponding with resource agencies, reviewing printed materials and making visits. Question 2 (a) sought to determine whether or not users were looking for any information about the innovation. While Question 11 tried to determine what kind of information the users were seeking in relation to their collaboration. Results from data analysis revealed, that teachers were making no special effort to seek

information as a part of on-going use with the innovation and in instances when effort was being made, a lack of resources hindered implementation. There was also evidence to suggest that teachers were only acquiring information from other teachers of Computer Studies within the department. Some of the responses to questions 2 (a) and 11 asked are given below.

Christine	Cindy
"recently, Cindy and I we just mentioned it, like having field trips so that am, the students will be able to connect what we are doing in the classroom with what is really going on outside"	"I have in terms of like with the practical work, like lesson on PowerPoint, but it is not being utilized because of no projector"

Christine

"well, the collaboration is minimal and limited to the teachers in the department but when I go to a workshop, I share with others"

Sharing

At this behavioural category the user discuss the innovation with others and shares plans, ideas, resources, outcomes and problems related to the use of the innovation. Question 3(a) and 12 examined the extent to which teachers were sharing information about their use with the innovation. Results from data analysis revealed that teachers were primarily sharing problems in response to question 3(a). In response to question 12, Christine indicated that she would normally share "how she used the technology within the classroom" she also indicated that she was talking to Cindy about, "*the possibility of having a field trip and introducing new pieces of software like AutoCAD in order to demonstrate it to the students*". Cindy and Maria did not

respond to this question. Based on the responses it was deduced that teachers were sharing ideas to a lesser extent but problems, to a greater extent, in relation to their use of the programme.

Assessing

At this behavioural category, the user examined the potential or actual use of the innovation or some aspects of it. This assessment can be mental or can involve actual collection and analysis of data. Eight questions on the protocol (Question 1, 1b, 4, 4a, 4b, 4c, 4d and 13) sought to elicit information from users on how they were assessing their use of the innovation. Additionally, the researcher also sought confirmation of this assessment via document analysis. Data analysis revealed that each teacher was having a different experience with the innovation, within the classroom. While all three teachers were able to delineate the strengths of the programme, they each provided different viewpoints on how they combat weaknesses within the programme. Responses to question 1(b) are presented below.

Christine	Cindy	Maria
"the technician said that there was a problem with the server"	"I have been trying by instilling in them, simple as putting it in the laptop bag so that no damage is done to it"	"I copy the exercise", "inform parents", "inform administration, the technician, students"

Variations were also present in teachers' assessment of the effects of the innovation (question 4). While Christine and Maria were able to identify positive effects of the innovation, Cindy saw no positive results from the programme thus far. Some of the effects of the innovation according Christine and Maria are as follows:

Christine

"Greater interest in the subject area". "More willing to learn, they ask questions"

Maria

"To complete their projects, interactive work, more group work"

When questioned on whether they were doing any evaluating, either formally or informally (question 4b), Christine indicated that she was doing no evaluation. Cindy and Maria's responses are outlined below.

Cindy	Maria
"I had typed up all my notes and started to use the projector but because of limited resources and I did not see a change in internet"	"oh yeah, but not really with the laptops but in terms of like presentations like with technology because we hardly have laptops so we using desktops for who don't have laptops"
"I have been begging for a projector for so long?"	

From the responses above, one can see that use of the innovation continued to be hampered by logistical issues within the school. These issues have forced Maria to modify the existing programme because of a lack of material resources in the form of laptops. Logistical issues were being experienced by the students as well. Responses to question 4 (c) outlined some of the feedback that teachers received from students.

Christine	Cindy	Maria
"they normally outline the problems, like if the keyboard Is not working"	"well a number of complaints is bringing it to school and it heavy, about like virus and it's not working and damages to it"	"yes, well they say the laptops not working, parents can't afford to fix the laptops, no technician available to fix the laptops"

Teachers indicated that once they received this feedback from students, they would usually, "refer them to the technician, if he is on the compound", "speak to each other about the problems" or "report the issues to administration with no help".

While no formal or informal evaluation has been done of their collaboration, Christine was of the opinion that their collaboration was working, while Maria felt that informal evaluation revealed issues "in terms of timetabling and use of the AV room" which are shared amongst all departments within the school. Maria's response to question 4 (b) is outlined below.

Maria
"well in terms of timetabling is two periods per week that is am, each class so two period to do theory and practical per week"
So 3M I will see Monday, 3L, Tuesday double and that is it until the next week"
"so how we have it half and half one will be in the lab two weeks and the next two weeks theory, next two weeks lab and so on"

> "and then sometimes if we request like the A.V. room another teacher will be in there, so even if you have a theory to do and you can do something in the A.V. room somebody else is using it and a new thing came out that you cannot book like two weeks in advance"
>
> "we told administration about it but in terms of the numbers its already 28, 29 periods per teacher so it is difficult to timetable extra time"

The Scheme of Work was analysed to confirm out-of class preparatory use which was mentioned to during the interview. Analysis focused on the elements of performing and assessing. Results of the analysis revealed, that routine assessments in the form of course work, mid-term and end of term examination was done during the term. However, only Maria indicated assessments in which the laptops were required for use. All other assessments were stated in general terms, giving no clear indication of how the laptops would be utilised during the assessment. In general, responses under the assessing category revealed that teachers were engaged in on-going assessment of the programme both in and out of the classroom. In classroom assessments facilitated use of the devices, while out-of-class assessments facilitated planning. These assessments also revealed a lack of support within the school and a lack of physical resources (projectors, laptops, space, internet, networking and clashes in timetabling) which impacted overall LoU.

Planning

This behavioural category examined whether the user is designing or outlining short and or long range steps to be taken during the process of innovation adoption. Two questions (6 and 14), sought to provide information on how the users were planning to utilise the innovation within the classroom. Results from data analysis revealed, that Christine had plans to "implement

some videos", while Maria indicated, that "administration will just have to buy desktops for the lab or fix them". Cindy did not respond to this question. When asked about their plans to promote their collaborative effort in the future, teachers indicated the following:

Christine – "to see how we can further enhance the collaboration to make it better"

Cindy – "looking into the possibility of going on field trips"

Maria – "get more timetabling"

The Scheme of Work confirmed that planning was done by all teachers of Computer Studies teachers on a termly basis. Based on the responses it can be deduced that short term plans surrounded enhancing use of the programme with the incorporation of multimedia videos, going on field trips, enhancing collaboration and getting more timetabling if possible. Long range plans entailed moving away from use of the laptops in favour of desktops.

Status Reporting

This behavioural category described the personal stand of the user at the present time, in relation to use of the innovation. Six questions (5, 5a, 6, 7, 8 and 15) sought to ascertain the user's status with the innovation. Results indicates that, Christine and Cindy have made no significant changes in their use of the innovation. However, Maria, has had to supplement use of the innovation with "desktops", which are provided by the school and she sometimes asks students to "walk with their IPad" to facilitate practical lessons. When questioned on whether or not, they were planning to make any changes to the existing use, Christine and Cindy indicated "no", while Maria indicated that:

"it is really up to the parents, because the warranty is up, he can't interfere or he cannot buy any parts, it will be a conflict of interest as he is the technician"

Questions 6, sought to determine teachers' status on long term planning. Results from data analysis revealed that all three teachers had no plans in relations to their long term use of the innovation. However, in relation to question 7, Cindy and Maria indicated that they were not working with others outside of the school. Only the Form one teacher alluded to outside collaboration, when she explained that, "sometimes, like when we have workshops, you know, you exchange ideas". When asked if they were planning to make any major modifications to replace the innovation at this time, Christine and Cindy said "no". The situation with the Form three teacher however, was very different. Because she had few working laptops she believed that major modifications were necessary to maintain continued use of the programme. She indicated the following:

"well administration fixing computers, to fix the desktops because he can't interfere with the laptops"

When asked to summarize, where they see themselves right now in relation to the use of the innovation, teachers' responses varied.

Christine

"I will say between routine and refinement"

Cindy

"I will continue to use the innovation but I believe the issues may limit how this is to be done"

Maria

"nothing, so basically, I depend on the school desktop to get technology"

The status of the programme within the school was being affected by a variety of factors which impacted LoU. One teacher was forced to supplement use of the laptops with desktops because most students at the form three level did not have laptops. Additionally, the warranty period was impacting how repairs were conducted, while logistical and infrastructural issues hindered long term planning and teachers were not working with others outside of the school to get help with use of the programme.

Performing

This behavioural category examined how the user carried out the actions and activities entailed in operationalizing the innovation. Two questions (5 and 9) sought to provide answers to this category. Data from the Scheme of Work and the classroom observation confirmed how the programme was used within the classroom. Data analysis revealed that Christine and Cindy were incorporating the multimedia projector within the classroom. However, limitations in access to the internet and a lack of networking facilities on the compound hindered the use of internet based resources within the classroom. The form three teacher also experienced performance issues because of a lack of functioning laptops at that level. When questioned about how they worked together, all teachers indicated that "we work well together".

Data derived from document analysis revealed that the laptops were being used to teach Microsoft Word in form 1, Excel in form 2 and PowerPoint in form 3, while the observation revealed that Maria had to use a combination of laptops and desktop to teach a lesson on Web Page Design. Based on the results of data analysis it was deduced that the laptop were being

used at varying degrees within the classroom. These variations occurred because of a lack of physical resources (laptops) mostly within form two and form three.

Summary of Findings

The intent of this study was to examine how teachers of Computer Studies were implementing the eCAL laptop programme within the classroom at Olive Leaf High School. Answers to this questions were derived using three data collection strategies, namely: document analysis, classroom observations and one analytical tool (the LoU focused interview) from the Concerns Based Adoption Model (CBAM).

Three teachers were interviewed and the findings from data analysis revealed that Christine and Cindy were experiencing "routine use", while Maria was experiencing "mechanical use" with the programme. Emergent themes from the seven behavioural categories highlighted the factors which contributed to these variations in overall LoU. These factors are listed below:

1. Logistical and infrastructural problems related to the availability of laptops, multimedia equipment, internet, networking facilities and space within the school;
2. A lack of external collaboration with other teachers using the programme;
3. A lack of technical support within the school; and
4. A limited (one year) warranty period which impacted timely repairs.

Chapter 5

Discussion and Recommendation

Discussion of findings

This chapter provides a discussion of the findings in relation to the literature and provides recommendations which are linked to each finding. The purpose of the study was to investigate how the eCAL laptop programme was being implemented within the classroom at Olive Leaf High School. I believed that the findings from the study could be used diagnostically by stakeholders to create interventions which can propel teachers of Computer Studies to move to a more advanced LoU. In general, data analysis revealed that Christine and Maria were experiencing "routine use" with the programme, while Maria was experiencing "mechanical use" with the eCAL laptop programme within the classroom. Emergent themes from the seven behavioural categories highlighted the factors which contributed to these variations in overall LoU. These factors are listed below:

1. Logistical and infrastructural problems related to the availability of laptops, multimedia equipment, internet, networking facilities and space within the school;
2. A lack of external collaboration with other teachers using the programme;
3. A lack of technical support within the school; and
4. A limited (one year) warranty period which impacted timely repairs.

The notion put forward by Hall (2010) that different implementers are not likely to use the technology exactly from classroom to classroom is relevant in light of the findings. Logistical and infrastructural issues were found to be a key factor in overall LoU within the school. This finding was consistent with research conducted by the CPDD which reported that "the school's infrastructure poses a huge problem in terms of the location of form one classes in

relation to where the routers are placed and the thickness of the wall of the school which does not allow the transmission of signals" (Salandy, 2011, p.4). Additionally, the Express article written by Allaham (2011) provided further legitimacy to the findings. Lei, Conway & Zhao (2008) have concluded that for laptops to have an impact in the classroom various elements (resources, peripheral technologies) must be present. The authors contend that if these elements are not present the quality and quantity of laptops use within the classroom will be impacted.

The second factor which created variation in LoU was a lack of external collaboration with other teachers using the programme. The eCAL policy outlined that "training and professional development are fundamental components of a successful laptop programme" (eCAL, 2010, p.7). This viewpoint is supported by studies conducted by Frank, Zhao & Borman (2004) and Riel & Becker (2000) who have indicated that when teachers take on more active roles within professional development for their own learning and for their colleagues' learning they are more likely to use technology with their students. Despite the fact that informal help from colleagues within the school is seen as valuable (Penuel, 2006). Research conducted by Garet, Orter, Desimone, Birman & Yoon as cited in Penuel, 2006) have concluded that participating in professional development activities with peers can contribute to the overall effectiveness of implementation.

The third finding which created variation in use was the amount of technical support that teachers received from the IT Technician. This finding was consistent with research conducted by Hill & Reeves (2004) which have determined that programmes in which teachers report a high degree of reliability for laptops often have both within building technical support staff devoted to helping with the program and ready access to outside vendors for major problems. Additionally, Penuel (2006) posited that readily available technical support appears to be

important for laptop programs to succeed. Ensuring that all students' laptops are working makes it less likely that teachers will have to develop two sets of assignments – one for students with laptops and another for students without laptops (Davis et al., 2005; Gaynor & Fraser, 2003; Zucker & McGhee, 2005 as cited in Penuel, 2006).

The final factor which accounted for variation in the LoU amongst teachers of Computer Studies was the one year warranty period which impacted efficient use of the devices for students in forms two and three. Findings indicated that students in form two and three had to make their own arrangements to repair non-functional laptops. This finding is consistent with research conducted by School Technology Sector (2010) which concluded that in the second and third years Emerge programs were beginning to experience some equipment failure associated with laptops and battery life. The concept of "technological sustainability" mentioned within the eCAL Policy document must be considered more closely if long term sustainable use of the programme has to be maintained. The Trinidad and Tobago Computer Society have outlined that "the government will need to have an arrangement with the manufacturer either to transfer the warranty to the student, or somehow to coordinate repairs on an on-going basis" (Trinidad and Tobago Computer Society, 2010, p. 3) to meet the technological sustainability requirement.

Recommendations

One of the expected outcomes of this study was to provide stakeholders (MOE officials, school administrators and teachers) with valuable information to determine sustainability of the programme over the long term. The findings have highlighted that greater attention must be paid to the conditions for laptop use to ensure the survival and prosperity of the programme within the school. Stakeholders must therefore play a greater role in monitoring and evaluation of the

programme. I believe that improvements in the underlying factors which are causing variations in overall LoU would propel teachers of Computer Studies across the implementation bridge and enable higher quality use within the classroom. In this regard, the following facilitation measures are recommended to increase overall LoU by teachers of Computer Studies at Olive Leaf High School.

1. In relation to the teachers who are experiencing "routine use", Hord et al. (1987) suggested that change facilitators should check with these users to see if there is anything that can be provided for them that would make their use of the innovation easier or better. It is therefore recommended that stakeholders within the school make more of an effort to monitor the progress of these teachers with a view to detecting problems and providing timely assistance when needed.
2. With respect to the teacher who is experiencing "mechanical use", Hord et al. (1987) outlined that persons at this LoU should try to observe other teachers who have worked out similar problems or at least, try to receive their verbal guidance on issues regarding the implementation of the innovation. In this regard, it is suggested that change facilitators make a point of impressing the strength of collaboration to the form three teacher so that she can receive some insight into how teachers from other schools are dealing with problems. Additionally, there is a need for the school to create a more sustainable support system between the IT Technician and the teachers. A first starting point, would be to bring small groups of teachers together with the IT Technician to encouraging sharing of problems and to provide an avenue for technical assistance to be given on problems being experienced. This recommendation is in keeping research

conducted by Penuel (2006) who concluded that informal help from colleagues within the school, may be especially important to ensuring implementation success.

4. The MOE pay closer attention to monitoring and evaluation of the programme within the school to mediate logistical and infrastructural issues. This recommendation is consistent with research conducted by Stansbury (2011) who concluded that a key to overcoming logistical issues is to provide the necessary technological infrastructure (network, electricity, wireless plan) to ensure sustainability of one to one computing programmes.
5. To ensure "technological sustainability" the MOE must adhere to a more structured process of change that facilitates laptop use beyond form one. This recommendation is in keeping with research conducted by School Technology Sector (2010) which recognised the critical need for a long-term maintenance, upgrade, and replacement cycles if the laptop programme is to be successful.

Hord et al. (1987) contend that while many factors may influence a person's LoU, the most powerful influence is the manner in which the implementation effort is facilitated at the level of the school. In their opinion, if no support and facilitating interventions are offered, many will never fully implement the innovation and others will remain non-users or at lower LoU. It is therefore the responsibility of stakeholders to ensure that teachers of Computer Studies at Olive Leaf High School receive the necessary facilitating measures to allow them to move to higher LoU with the eCAL laptop programme within the classroom.

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Appendix A – Levels of Use with Decision Points

Users	*Decision Point F:* Begins exploring alternatives to or major modifications of the innovation presently in use. *Level VI, Renewal:* State in which the user re-evaluates the quality of use of the innovation, seeks major modifications of or alternatives to present innovation to achieve increased impact on clients, examines new developments in the field, and explores new goals for self and the organization. *Decision Point E:* Initiates changes in use of the innovation for benefit of clients based on input from and in coordination with colleagues. *Level V, Integration:* State in which the user is combining own efforts to use the innovation with related activities of colleagues to achieve a collective impact on clients within their common sphere of influence. *Decision Point D-2:* Changes use of the innovation to increase client outcomes based on formal or informal evaluation. *Level IVB, Refinement:* State in which the user varies use of the innovation to increase the impact on clients within his or her immediate sphere of influence. Variations in use are based on knowledge of both short- and long-term consequences for clients. *Decision Point D-1:* Establishes a routine pattern of use. *Level IVA, Routine:* Use of the innovation is stabilized. Few if any changes in use are made. Little preparation or thought is given to improving innovation use or its consequences. *Decision Point C:* Makes user-oriented changes. *Level III, Mechanical Use:* State in which the user focuses most efforts on the short-term, day-to-day use of the innovation, with little time for reflection. Changes in use are made more to meet user needs than the needs of clients. The user is primarily engaged in an attempt to master tasks required to use the innovation. These attempts often result in disjointed and superficial use.
Nonusers	*Decision Point B:* Makes a decision to use the innovation by establishing a time to begin *Level II, Preparation:* State in which the user is preparing for first use of the innovation *Decision Point A:* Takes action to learn more detailed information about the innovation *Level I, Orientation:* State in which the individual has acquired or is acquiring information about the innovation and/or has explored its value orientation and what it will require *Level 0, Nonuse:* State in which the individual has little or no knowledge of the innovation and no involvement with it, and is doing nothing to become involved

Source: From Measuring Levels of Use of the Innovation: A Manual for Trainers, Interviewers, and Raters (pp. 173-195) by Loucks, Newlove and Hall (1975)

Appendix B – Levels of Use Interview Protocol

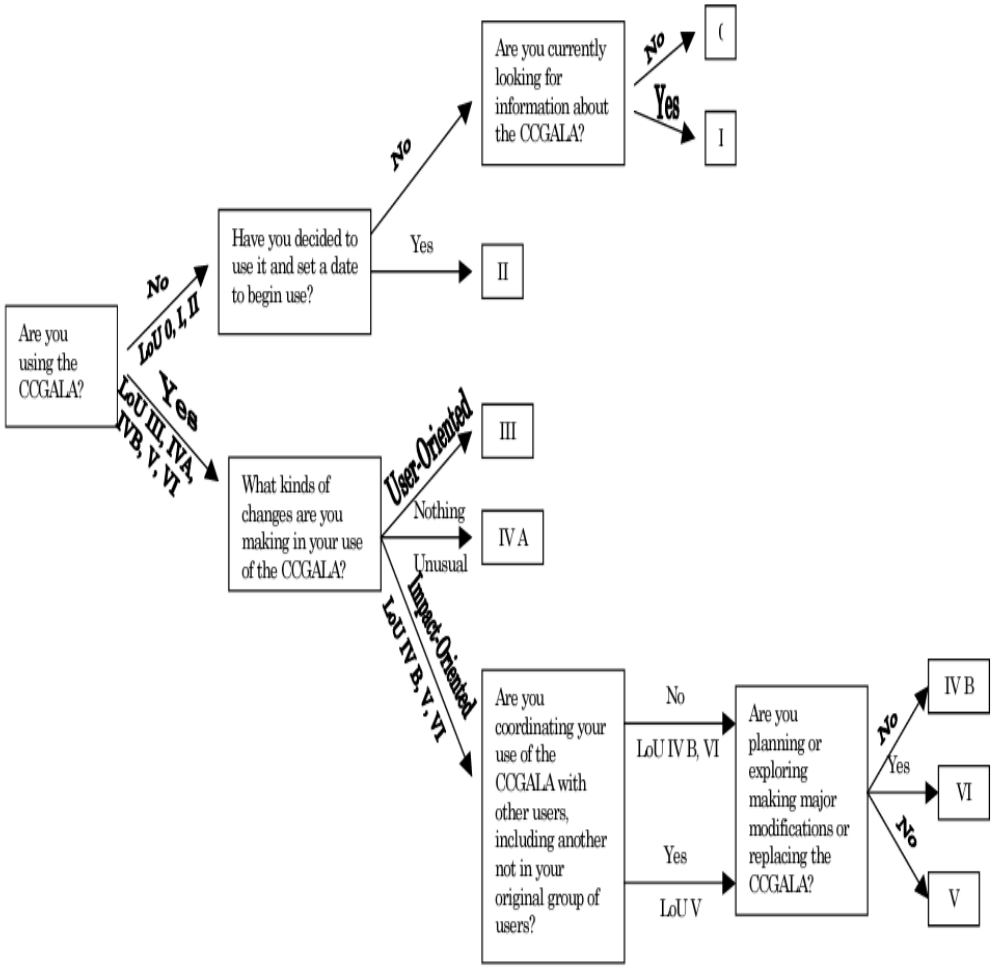
The Basic Interview Protocol

Question	Purpose
Are you using the innovation?	To distinguish between users and nonusers; to break LoU 0–II from LoU III–VI
IF YES	
What do you see as the strengths and weaknesses of the innovation in your situation? Have you made any attempt to do anything about the weaknesses?	To probe Assessing and Knowledge Categories.
Are you currently looking for any information about the innovation? What kind? For what purpose?	To probe Acquiring Information Category.
Do you ever talk with others about the innovation? What do you tell them?	To probe Sharing Category and check Decision Point E.
What do you see as being the effects of the innovation? In what way have you determined this? Are you doing any evaluating, either formally or informally, of your use of the innovation? Have you received any feedback from students? What have you done with the information you get?	To probe Assessing Category.
Have you made any changes recently in how you use the innovation? What? Why? How recently? Are you considering making any changes?	To distinguish between LoU III (user-oriented changes), LoU IVB (impact-oriented changes), and LoU IVA (no or routine changes); to probe Status Reporting and Performing Categories.
As you look ahead to later this year, what plans do you have in relation to your use of the innovation?	To probe Planning and Status Reporting Categories.

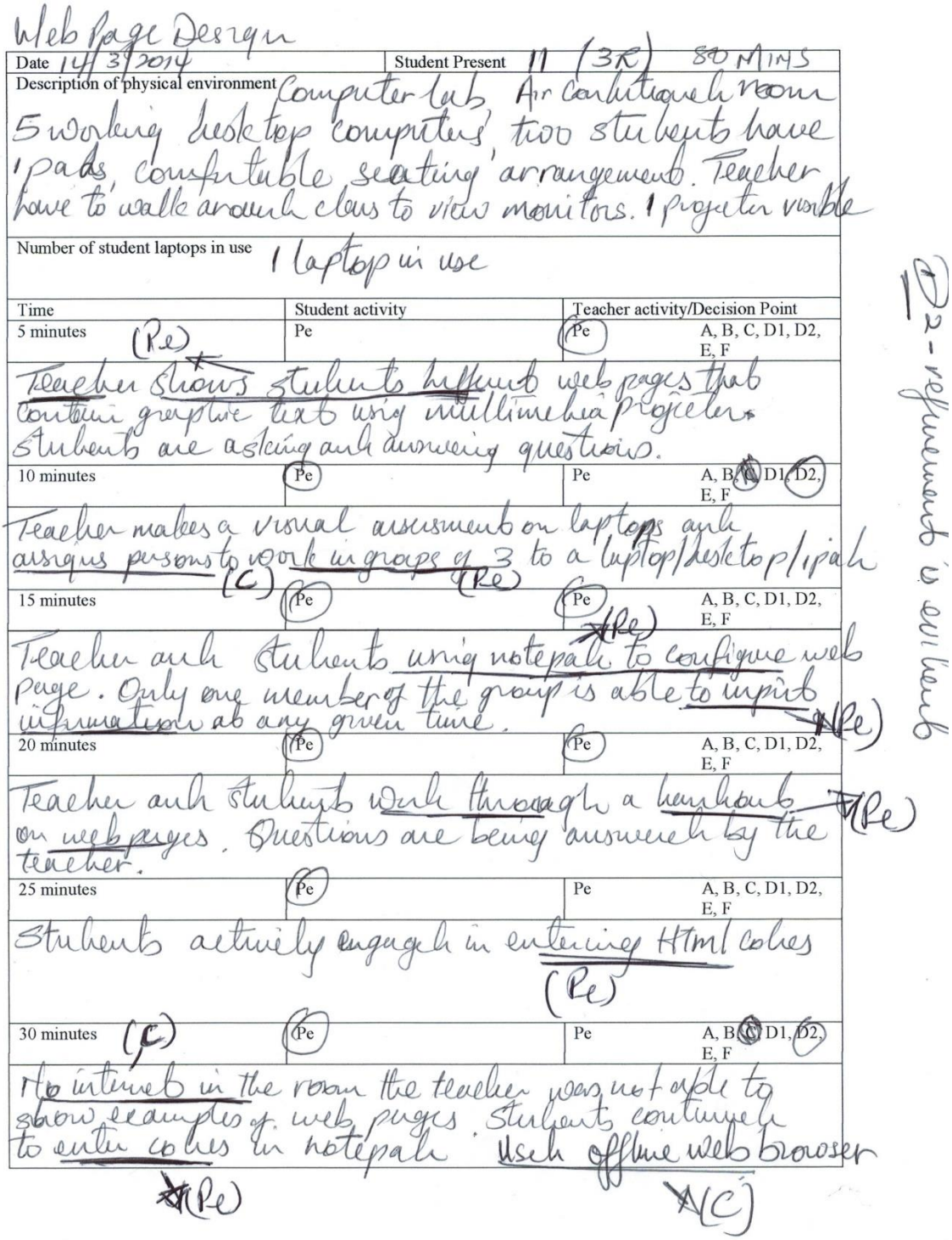
Are you working with others (outside of anyone you may have worked with from the beginning) in your use of the innovation? Have you made any changes in your use of the innovation based on this coordination?	To separate LoU V from III, IVA, and IVB. If a positive response is given, LoU V probes (below) are used.
Are you considering making or planning to make major modifications or to replace the innovation at this time?	To separate LoU VI from III, IVA, IVB, and V.
LoU V Probes	
How do you work together? How frequently?	To verify Decision Point E; to probe Performing Category.
What are the strengths and the weaknesses of this collaboration for you?	To probe Knowledge Category.
Are you looking for any particular kind of information in relation to this collaboration?	To probe Acquiring Information Category.
When you talk to others about your collaboration, what do you share with them?	To probe Sharing Category.
Have you done any formal or informal evaluation of how your collaboration is working?	To probe Assessing Category.
What plans do you have for this collaborative effort in the future?	To probe Planning Category.
Can you summarize for me where you see yourself right now in relation to the use of the innovation? (Optional Question)	To get a concise picture of the user's perception of his/her use or nonuse.

Source: Hall, Dirksen and George (2006). Measuring Implementation in Schools: Levels of Use

Appendix C – LoU Branching Interview Framework



Appendix D: Observation Protocol



Web Page Design

Date 14/3/2014	Student Present 11 (3R)	80 MINS

Description of physical environment: Computer lab, Air conditioned room, 5 working desktop computers, two students have ipads, comfortable seating arrangement. Teacher have to walk around class to view monitors. 1 projector visible

Number of student laptops in use: 1 laptop in use

Time	Student activity	Teacher activity/Decision Point
5 minutes	Pe (Re)	Pe	A, B, C, D1, D2, E, F
Teacher shows students different web pages that contain graphic text using multimedia projector. Students are asking and answering questions.		
10 minutes	Pe	Pe	A, B, C, D1, D2, E, F
Teacher makes a visual assessment on laptops and assigns persons to work in groups of 3 to a laptop/desktop/ipad (C) (Re)		
15 minutes	Pe	Pe (Re)	A, B, C, D1, D2, E, F
Teacher and students using notepad to configure web page. Only one member of the group is able to input information at any given time. (Re)		
20 minutes	Pe	Pe	A, B, C, D1, D2, E, F
Teacher and students work through a handout on web pages. Questions are being answered by the teacher. (Re)		
25 minutes	Pe	Pe	A, B, C, D1, D2, E, F
Students actively engaged in entering Html codes (Re)		
30 minutes (C)	Pe	Pe	A, B, C, D1, D2, E, F
No internet in the room the teacher was not able to show examples of web pages. Students continuely to enter codes in notepad. Used offline web browser (Re) (C)		

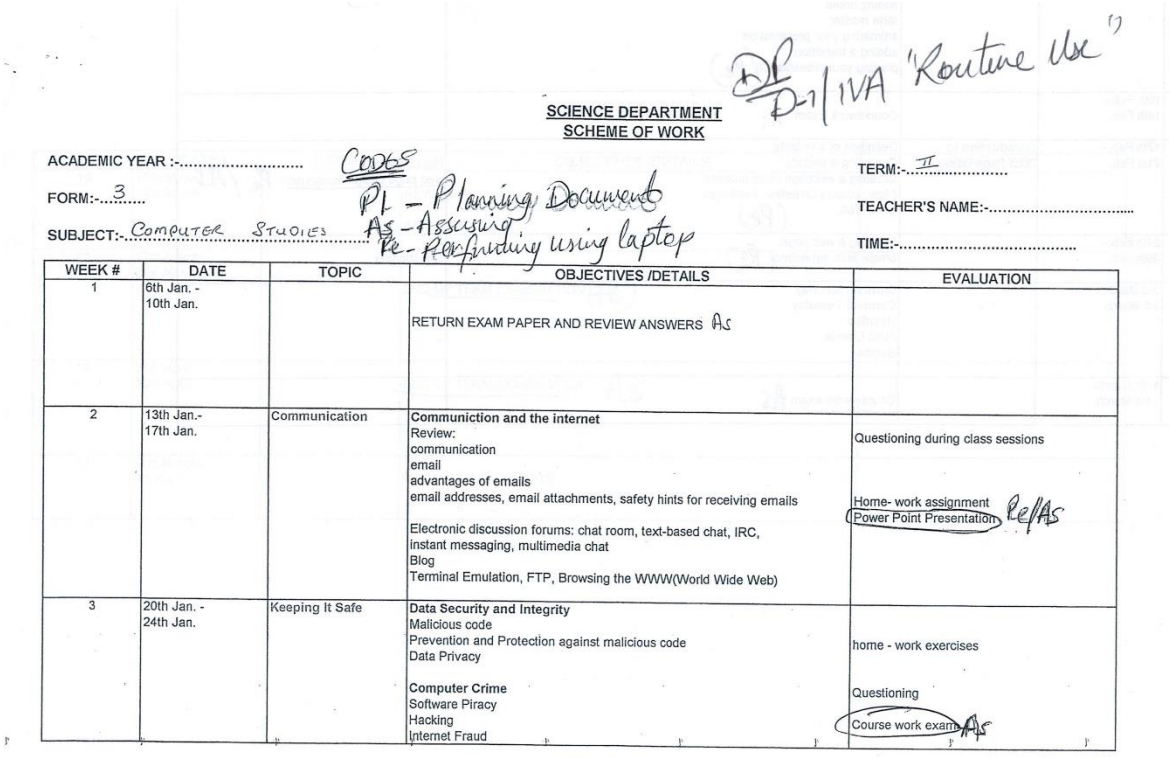
1 D2 - refinements is outlined

Appendix E – LoU Behavioural Categories

Category	**Meaning**
Knowledge (**Kn**)	That which the user knows about characteristics of the innovation, how to use it, and consequences of its use. This is cognitive knowledge related to using the innovation, not feelings or attitudes.
Acquiring Information (**Ac**)	Solicits information about the innovation in a variety of ways, including questioning, resource persons, corresponding with resource agencies, reviewing printed materials, and making visits.
Sharing (**Sh**)	Discusses the innovation with others. Shares plans, ideas, resources, outcomes and problems related to use of the innovation.
Assessing (**As**)	Examines the potential or actual use of the innovation or some aspect of it. This can be a mental assessment or can involve actual collection and analysis of data.
Planning (**Pl**)	Designs and outlines short and or long range steps to be taken during process of innovation adoption, i.e. aligns resources, schedules and activities, and meets with others to organize and or coordinate use of the innovation
Status Reporting (**St**)	Describes personal stand at the present time in relation to use of the innovation.
Performing (**Pe**)	Carries out the actions and activities entailed in operationalizing the innovation.

Source: Hall, Dirksen & George (2006). Measuring Implementation in Schools: Levels of Use

Appendix F: Document Analysis (Scheme of Work)



D-1/IVA 'Routine Use'

SCIENCE DEPARTMENT
SCHEME OF WORK

ACADEMIC YEAR :-.....

FORM:-3.....

SUBJECT:- COMPUTER STUDIES

Codes
Pl - Planning Document
As - Assessing
Re - Researching using laptop

TERM:- II

TEACHER'S NAME:-.....

TIME:-.....

WEEK #	DATE	TOPIC	OBJECTIVES /DETAILS	EVALUATION
1	6th Jan. - 10th Jan.		RETURN EXAM PAPER AND REVIEW ANSWERS As	
2	13th Jan.- 17th Jan.	Communication	**Communiction and the internet** Review: communication email advantages of emails email addresses, email attachments, safety hints for receiving emails Electronic discussion forums: chat room, text-based chat, IRC, instant messaging, multimedia chat Blog Terminal Emulation, FTP, Browsing the WWW(World Wide Web)	Questioning during class sessions Home- work assignment Power Point Presentation Re/As
3	20th Jan. - 24th Jan.	Keeping It Safe	**Data Security and Integrity** Malicious code Prevention and Protection against malicious code Data Privacy **Computer Crime** Software Piracy Hacking Internet Fraud	home - work exercises Questioning Course work exam As

SCIENCE DEPARTMENT

WEEK #	DATE	TOPIC	OBJECTIVES /DETAILS	EVALUATION
4	3rd Feb.- 7th Feb.		**Presentatyion Software** Effective PowerPoint Presentation moving slides adding notes slide master animating your presentation adding a transition printing your presentation (Pe)	Oral exam Questioning during class sessions assignment (As)
5	10th Feb.- 14th Feb.		Coursework Exam As	
6	17th Feb.- 21st Feb.	Introduction to Web Page Design	Definition of a website Designing a website Creating a webpage using notepad (font, colours,underline, headings) Use HTML (Pe)	Home- Work wed page design assignment Pe /As
7	24th Feb.- 28th Feb.		Creating a web page. create lists, hyperlinks (Pe)	Questioning
8	3rd March.- 7th March		**Carnival Monday** **Carnival Tuesday** Revision Field Events Sports	
9	10th March- 14th March		Course work exam As	

Appendix G: Approval to conduct research

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

May 5th 2014

Dear Ms. Phillip,

Your request to conduct your research entitled "**Case Study into Teachers' Concern and Impact on Levels of Use on the Implementation of the eCaL (e-Connect and Learn)**" 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 research through the Ministry.

Yours Respectfully,

Mrs. Lenor Baptiste-Simmons
Director
Educational Planning Division
Ministry of Education

Appendix H: Timeline of Study

Activity	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE
Formalizing the research idea								
Literature Review								
Methodology								
Data collections – Stage 1								
Data collection – Stage 2								
Analysis of data								
Report writing								
Final Submission								

Appendix I: Open coding of interview (raw data)

Form 3

1

Interview with [redacted]

Interviewer	Teacher	Code
So good morning and thank you for taking time out of your day to meet with me, really what I am trying to do is to ascertain how teachers are using innovations and to do so I am going to use a tool that was developed by Hall and Hord called the LOU for cussed interview protocol, okay, so it is nice to meet you. So first thing firist the interview is going to be guided by the protocol so you will find that even though we deviate somewhat it would still be in line with the protocol for us to be able to get your level of use. Question: So are you using the innovation the eCAL laptop initiative	Yes	LOU III User
Question: So, what do you see as the strnegths and weaknesses of the innovation in your situation Yes	We talking about 1,2, 3 right	—
	Okay, well I teacher 3m, 3L, 2 classes, 3M, the laptops if is 20 students I have, 10% have laptops	kn/III
If it is 20, 10% so you talking about only 5 persons in the class	Yes, 5% laptops working out of 20 in 3L, one out of 10 working and the other students dropout, 4 students dropout.	III
And one out of ten working so again in 3L only about 5 laptops working	One out of the ten students	
Only one working out of the ten students	Ten students, yeah	
Oh Jesus, definite weakness, any ther weaknesses, any other classes that you teach other than 3M and 3L	4B	
4B but they don't use the laptops anymore?	They got the laptops from the government but none of them the laptops are not working	0 no use
In 4B now?	Yes	
Oh Jesus, so that is weaknesses, that they not working, the lapotps not working okay, so what would you see as strengths then?	Well, the strength is that we have the resources in school, 5 out of the 20 working, so those students could work on those laptops and with 3L is ah problem because they don't have enough resources.	~~III~~ As/ III
So more weaknesses than strengths in that regard any other weaknesses and strengths other than not having the laptops?	Textboks in 3L, textbooks is an problem and	kn/cIII
But the textbooks came with the textbook rental programme?	No, theose are textbooks the student had to buy. All the students in 3M they have textbook except one child so what I usually do for 3L I copy the exercise and give it to them.	As/Drive An attempt to ho something about the weakness
So then lack of textbook is definitely a weaknesses?	Parents know about that, I inform parents, till they give them up to the end of the term, nothing, so in order to finish, I give them the exercise.	no support from parents

Ques 1

2

Interviewer	Teacher	Code
Another thing, a teacher told me that internet connectivity was a weaknesses, is that a weakness for you?	No not really cause I don't really use the internet as such	0 No internet
And then you don't have enough machines any way	Exactly!	
So have you made any attept ot do anyting about the weaknesses?	Yes, I inform administration, inform the technician, inform the parents about the laptops inform the students, the students they could go to am outside to get it fix but what am Jim told me is that am in order to do certain things you have to get the BIOS password for these laptops in order to install and do certain things but other than that sutdents are saying that it is too costly to buy a screen or fix a key so they just not bothering with it, so that is the main thing.	~~IVA~~ III/kn No support IT tech, Administration
Okay, so you are currently looking for any information about the innovation? Like just general information, sometimes you will be using something new and you may look to see how you can use it better, you may look to see, you know, if it is	Well we had a workshop in IT for am four 4 and 5 and we have a website that we can go in where the textbook is online and we have multiple choice and that so we have a workshop for form four.	for IT not eCAL Ac/NI
But does that workshop extend to persons using the ecal or is it that you use the information, some of the information from there to inform the eCAL?	Right, but am that again you need internet access weakness	kn/III
Well that is what I was saying	It is only for the form 4 and 5	
Oh that would mean you have a weaknesses there, okay, so the kind of information that you get would be information of how too use technology, what kind of information they would provide on the website?	No is actually is sort of like the textbook online but they break it down they have like quiz, multiple choice, you know things like that.	Non Use O Ac/NI
But is it information that the 1-4 using right now?	No, they are not using it	
So, the information may not always be relevant	Is what form 4 and what form 5 would use, it is based on CXC syllabus	
So it is not really for eCAL okay, alright, so do you ever talk with others about the innovation?	Talk about the problems (laughter)	Sh/IVA
So the next question is what do you tell them	All the problems:	Sh/IVA
Oh lord Recommendation support teacher	So the main issue is really having somebody in school to fix the laptops and then if it is issues where you have to purchase items the technicians can't purchase	~~IVB~~ III
And then you have to get the tenders before and go through process which is keeping you back	No, but only form ones have the warranty = weakness	St/IVA
	Only the form ones have the warranty key	St/IVA
Oh and that going and end, just now again	So the 2,3,4 right now no warranty, no parents going to fix no laptop	St/IVA
Oh and so that is how you are experiencing a different type of problem because you not teaching from one so you find the form ones will have laptops now but the persons who in form 2 going up that is ah problem, that is why I am seeing a different kind of problem with use of the device	Yes, so what am students tell me and all like I would ask like different people who would play games, some who would not play games, some who I know will take care of the laptop and they tell me that the laptop just not good. Because a child who don't play	~~IVB~~ III As/ St 3 Neglect

Interviewer	Teacher	Code
	games and they find like a key something wrong with the key	As/III
Okay, so what do you see as being the effects of the ecal? What type of effects have you or do you think you could get from using the eCAL if it is used in the proper way?	Well am, students will be able to complete their projects, interactive work, more group work all those kinds of things	IVA
So the next question is in what ways have you determined this?	That is just observational	
So are you doing any evaluating, either formally or infrormally, of your use of the innovations? When I say evaluating I ccan talk about what I do here	Evaluating myself no real evaluations being have	
Yourself, like you know you might see you do something one term and then you decide I might have to shift something	Oh yeah, but not really with the laptops but in terms of like presentations like with technology then	IVA As/
Oh okay but not in terms of like the eCAL	Because we hardly have laptops so we using desktops for who don't have laptops	III/ As
Okay, so the other question is then, okay, so it is difficult even if you are evaluating the only things you can evaluate is problems and then there is no real way to solve the problems	And then there is laptops eCAL and then there is desktops in the lab, so is ah	III
So it is that when the children don't come with all the laptops that you all switch to desktops	Yes, and there will be 3-4 to ah desktop — Problem/issue	
So, have you received any feedback from students?	Yes, well they say the laptops not working parents can't afford to fix the laptops, no technician available to fix the laptops	III As
And you said that you have reported this information to the administration and even to the IT technician with no help? Have you made any changes recently in how you sue the innovation? Given the fact that you have all these challenges what have you done to mediate it with the two's and the three's	Three's not twos, well the desktop helps out and plus like handouts and little things to show them, so I usually demonstrate a lot and then well four to a desktop to show hot to develop web pages and things like that and then so those who have it I will ask them to bring their ipad so they can type in note pad and little things like that, so 3L did that.	III? IVB/IVA St/Re IVB
How recently you all did that	This term, 3 students walked with their ipad so they typed in note pad, so they did their webpage	III IVB St/Re
And they were able to do that, the webpage	Right but they walk with 2 ipad and one laptop	III
Okay but you all don't need internet to do the webpage?	No, cause I was just teaching them how to build it so when they see the colours hanging, you know	Re/III
Are you considering making any changes to these am things, to your present way that you would integrate the laptops into your classroom?	Well I spoke to the technician again	St/IVA
What did he say	Am, he said that he did a report on how many working, how many not working he submit it to the office.	III St
From the 370 we received, 110 not working and I believe that 110 is an underestimation	I feel is 300 not working	III St/IVA
So, he said he will follow up on it	No, he is saying its really up to the parents, cause the warrantly is up he can't interfere or he cannot buy any parts, it will be a conflict of interest as he is the technician, those sort of things.	III St/IVA

Type; clean water, salt water

Appendix J: Open codes derived from raw data (Interviews/Scheme of Work/Observations)

Question 1 (a): What do you see as the strengths and weaknesses of the innovation in your situation?

Christine		Cindy		Maria	
Strength	Weaknesses	Strength	Weaknesses	Strength	Weaknesses
"each individual child has the opportunity to own their own laptop, there is no sharing, homework can be done, assignments can be done at home when assignments are given out to students"	"internet, the students don't have internet access at school and then at home some do not have internet access either so if the individual has to do further reading or research for projects, etc there is a problem there"	"all students are interested because it is the laptop you know, because it is technology, some are interested and they want to know more"	"they not using it the way it should, like for example, they abuse it in terms of playing games and telling their parents that they are doing school work when in fact they are not"	We have the resources in school, so the students could work on those laptops	Textbooks in 3L is a problem because they don't have enough resources
As/DP C/III	**Kn/DP C/III**	**As/DP C/III**	**Kn/DP C/III**	**As/DP C/III**	**Kn/DP C/III**
	"with respect to if you have hardware or software malfunction there is no am technician on site to deal with the issues in the classroom"		"some students might not have prior knowledge, they not using it correctly and even though you instruct them like simple things how to turn it on, how to turn it off they not getting the		5% laptops working out of 20 in 3L

Christine		Cindy		Maria	
Strength	Weaknesses	Strength	Weaknesses	Strength	Weaknesses
			sense of how to properly use the device"		
	"if they have to connect, a printer to their laptop, there is a problem because you have to get the administrator code and all that to access the network, which is not working"		"because even though it will be repaired in what time frame will it be repaired"		No internet access
	"we don't really have a technician"		"no projector, no fixed room, because to take all my stuff to class is very hard, I have a bag, my hands are full, you can't even carry a projector, you need set up time, it is difficult and you lose teaching time, you really have limited teaching time because it is only two		

Christine		Cindy		Maria	
Strength	Weaknesses	Strength	Weaknesses	Strength	Weaknesses
			period per day"		
	"sometimes we have a drawback in the use of the laptop because the student don't bring it to school"		"we have the problem that always exists when students are timetabled on Fridays' and there are activities on Fridays', I miss my Maria for three weeks in ah row and I had to take seven periods in ah week trying to make up the time"		
	"computer viruses is also a weakness"				
As/DP C/III	**Kn/DP C/III**	**As/DP C/III**	**Kn/DP C/III**	**As/DP C/III**	**Kn/DP C/III**

Question 1 (b): Have you made any attempt to do anything about the weaknesses?

Christine	Cindy	Maria
"well the technician said that am there was a problem with the server we have, in that the server cannot accommodate the amount of users"	"I have been trying by instilling in them simple as putting it in the laptop bag so that no damage is done to it"	What I usually do for 3L I copy the exercise and give it to them.
		Parents know about the lack of textbooks, "I inform parents, till they give them up to the end of the term, nothing, so in order to finish, I give them the exercise
		"Yes, I inform administration, inform the technician, inform the parents about the laptops inform the students that they could go outside to get it fix but what am the technician told me is that am in order to do certain things you have to get the BIOS password for these laptops in order to install and do certain things but other than that student are saying that it is too costly to buy a screen or fix a key so they just not bothering with it"
As/DP D-2/IVB	**As/DP D-2/IVB**	**As/DP D-2/IVB**

Question 2(a) Are you currently looking for any information about the innovation? What kind? For what purpose?

Christine	Cindy	Maria
"well, I normally use the projector, in order to give examples and execute lesson plans etc. I also use the projector in conjunction with the laptops and then I would give them a similar lesson to follow, so that they can do on their own"	"I have in terms of like with the practical work, like lesson on PowerPoint, but it is not being utilized because of no projector"	No response
"recently, Ms. M and I we just mentioned it, like having field trips so that am, the students will be able to connect what we are doing in the classroom with what is really going on outside"		
"for example, like in the Cindy, we do applications of ICT areas in which ICT will be used like in banking and business, engineering, etc, etc, so we were considering, we just briefly spoke about it"		
Ac/DP D-1/IVA	**Ac/DP D-1/IVA**	**Ac/NI**

Question 3 (a): Do you ever talk with others about the innovation? What do you tell them?

Christine	Cindy	Maria
"yes, I talk to Ms. M briefly and we have the same issues, we have the same problems"	"not regularly, I had to try to go to an IT workshop and it was cancelled and I have not been to any ICT workshops for the longest while"	"talk about the problems". I tell them "all the problems"
"there are the advantages as well as the disadvantages and am, well we try to work to suit"		"I would ask like different people who would play games, some who would not play games, some who I know will take care of the laptop and they tell me that the laptop just not good, because a child who don't play games and they find like a key something wrong with the key"
Sh/DP D-1/IVA	**Sh/DP D-1/IVA**	**Sh/DP D-1/IVA**

Question 4: What do you see as being the effects of the innovation?

Christine	Cindy	Maria
"they have a greater interest in the subject area, right am, they are more willing to learn, they ask questions"	"I don't think it has made much of a difference because we not seeking any positive results from it"	"students will be able to complete their projects, interactive work, more groupwork all those kinds of things"
As/DP C/III	**As/DP D-1/IVA**	**As/DP C/III**

Question 4 (a): In what way have you determined this?

Christine	Cindy	Maria
"well general feedback from the students"	No response	"this is just observational"
As/DP D-1/IVA	**As/NI**	**As/DP D-1/IVA**

Question 4 (b): Are you doing any evaluating, either formally or informally, of your use of the innovation?

Christine	Cindy	Maria
No	"I had typed up all my notes and started to use the projector but because of limited resources and I did not see a change in internet because maybe you are taking the time to take them to the AV room and you know they were ah little interested but because of resources. I have been begging for a projector for so long"	"oh yeah, but not really with the laptops but in terms of like presentations like with technology because we hardly have laptops so we using desktops for who don't have laptops"
As/NI	**As/DP C/III**	**As/DP C/III**

Question 4 (c): Have you received any feedback from students?

Christine	Cindy	Maria
"they will normally outline the problems like if the keyboard is not working that kind of thing"	"well a number of complaints is bringing it to school and it heavy about like virus and it's not working and damages to it, not much positive"	"yes well they say the laptops not working parents can't afford to fix the laptops, no technician available to fix the laptops"
As/DP C/III	**As/DP C/III**	**As/DP C/III**

Question 4 (d): What have you done with the information you get?

Christine	Cindy	Maria
"well, I normally refer them to the technician if he is on the compound"	"I would inform the IT technician and speak with Miss D because we have the same group, we would talk about the problems"	"I have reported this information to administration and even to the IT Technician with no help"
As/DP D-2/IVB	**As/DP D-2/IVB**	**As/DP D-2/IVB**

Question 5: Have you made any changes recently in how you use the innovation? What? Why? How recently?

Christine	Cindy	Maria
"no, because as I said before I started of like just am we will read the book, the text book, initially, we would have read the text book and I would tell them what to do in terms of the steps to follow if you want to create a folder etc, etc, but now as we have the use of the AV room, I actually show them using my laptop the exercise right so that is the only addition that I have used, the use of the multimedia at the beginning of this term"	"Yeah, I do that sometimes in the lab but now I have started like with the Christine's well this term, I have started to take the projector into the classroom, so instructional, step by step, I have been doing that this term"	"well the desktop helps out and plus like hand-outs and little things to show them, so I usually demonstrate a lot and then well four to a desktop to show how to develop web pages and things like that and then so those who have it I will ask them to bring their IPad so they can type in notepad and little things like that"
		That was done during "this term, three students walked with their IPad so they typed in note pad they walked with two IPads and one laptop"
St/Pe/DP D-2/IVB	**St/Pe/DP D-2/IVB**	**St/Pe/DP D-2/IVB**

Question 5 (a): Are you considering making any changes?

Christine	Cindy	Maria
"at the moment, no"	No response	"well I spoke to the technician again, he said that he did a report on how many working, how many not working and he submit it to the office"
		"the IT Technician is saying it is really up to the parents, because the warranty is up, he can't interfere or he cannot buy any parts, it will be a conflict of interest as he is the technician, those sorts of things"
St/DP D-1/IVA	**St/NI**	**St/DP D-1/IVA**

Question 6: As you look ahead to later this year, what plans do you have in relation to your use of the innovation?

Christine	Cindy	Maria
"no plans" "well probably I should implement some videos as well, I think I should do that"	"no plans"	"None, administration will just have to buy desktops for the lab or fix them so that, because it seems as if the whole eCAL is a failure in this school, I won't say no other school"
		"in most schools the laptops working". "Some schools they not using it for the subject area then like if it is maths, social or anything but in some schools they use it for assignment, Microsoft word, to type, little things with the form ones"
St/Pl/DP D-1/IVA	**St/Pl/DP C/III**	**St/Pl/DP C/III**

Question 7: Are you working with others (outside of anyone you may have worked with from the beginning) in your use of the innovation? Have you made any changes in your use of the innovation based on this coordination?

Christine	Cindy	Maria
"am sometimes, like when we have workshops, you know you exchange ideas, etc.	"not working with others only working with teachers within the school to develop test and scheme of work"	"I am not really working with others or sharing anything with persons outside"
"well more or less they use the same things, multimedia projectors, I have not met anybody who is using like smart board and all that"		"most of them don't have problems like us"
		"we have no laptops"
St/DP E/(V)	**St/DP E/V**	**St/DP C/III**

Question 8: Are you considering making or planning to make major modifications or to replace the innovation at this time?

Christine	Cindy	Maria
"no"	"I have no plans to make major modifications"	"well administration fixing computers"
		"to fix the desktops because he can't interfere with the laptops"
St/DP C/III	**St/DP C/III**	**St/DP C/III**

Question 9: How do you work together? How frequently?

Christine	Cindy	Maria
"we work well together"	"we work well together"	"well we have half and half and am, same scheme of work"
		Discussions are usually held "casually on the corridor"
Pe/DP D-1/IVA	**Pe/DP D-1/IVA**	**Pe/DP D-1/IVA**

Question 10: What are the strengths and weaknesses of this collaboration for you?

Christine	Cindy	Maria
"well, as I said before the class is divided into two, so it means that we have a smaller group and with the smaller group, it works well for me, I find I am able to focus better on the students so if there are any questions, you know some students tend to take up, you know the speed at which they am gather the information, or take in the information might be slower, some might be slower than others"	Strength: "we talk about scheduling and test setting, standardised assessment". No weaknesses	Strength: "well we able to cover the scheme of work for the entire term and things like that to ensure that we are on the same level, we discuss like the weakness if we need to set a particular class different, based on what topics like with the 3L group especially"
"well for the lower Christine and 2 and 3 this term, I will do form one lesson planning and well the exam, Miss M might do the Cindy exams and lesson plans, yes we split up the responsibilities. So this term I did form one lesson plans as well as the exam"		
Kn/DP D-1/IVA	**Kn/DP D-1/IVA**	**Kn/DP D-1/IVA**

Question 11: Are you looking for any particular kind of information in relation to this collaboration?

Christine	Cindy	Maria
"well, the collaboration is minimal and limited to the teachers in the department but when I go to a workshop, I share with others"	"well Ms. D and I spoke about the possibility of carrying children out on field trips to see how technology is being used in the workplace"	"yeah, well we usually discuss like when workshops come up and different issues"
Ac/DP D-1/IVA	**Ac/DP D-1/IVA**	**Ac/DP D-1/IVA**

Question 12: When you talk to others about your collaboration, what do you share with them?

Christine	Cindy	Maria
"just how we use the technology in the classroom"	No response	No response
"like I was telling you before, well, Miss M and I was talking about the field trips and she was talking about having new pieces of software like the Autocad in order to demonstrate it to the students, the use of the software"		
Sh/DP C/III	**Sh/NI C/III**	**Sh/NI C/III**

Question 13: Have you done any formal or informal evaluation of how your collaboration is working?

Christine	Cindy	Maria
"no we have not done any formal or informal assessments but I believe it is working"	No evaluation done	"well in terms of timetabling is two periods per week that is am, each class so two period to do theory and practical per week"
		So 3M I will see Monday, 3L, Tuesday double and that is it until the next week"
		"so how we have it half and half one will be in the lab two weeks and the next two weeks theory, next two weeks lab and so on"
		"and then sometimes if we request like the A.V. room another teacher will be in there, so even if you have a theory to do and you can do something in the A.V. room somebody else is using it and a new thing came out that you cannot book like two weeks in advance"
		"we told administration about it but in terms of the numbers its already 28, 29 periods per teacher so it is difficult to timetable extra time"
As/DP C/III	**As/DP C/III**	**As/DP F/VI**

Question 14: What plans do you have for this collaborative effort in the future?

Christine	Cindy	Maria
"to see how we can further enhance the collaboration to make it better"	"looking into the possibility of going on field trips"	"get more timetabling"
Pl/DP E/V	**Pl/DP E/V**	**Pl/DP E/V**

Question 15: Can you summarize for me where you see yourself right now in relation to the use of the innovation?

Christine	Cindy	Maria
"I will say between routine and refinement"	"I will continue to use the innovation but I believe the issues may limit how this is to be done"	"nothing, so basically, I depend on the school desktop to get technology"
St/DP D-1/IVA	**St/DP D-1/IVA**	**St/DP F/VI**

Appendix K: Axial Coding (Observations/Schemes of Work/Interviews)

Axial Coding – Using Codes from the Behavioural Categories and Decision Points (Observations)

Observation 1 – Maria

Category	**Code/Decision Point**	**Emerging Theme**
Performing	Pe/D-1/IVA	"teacher shows students different webpages" "students using notepad to configure Web page" "Only one member of the group able to input information" "teacher and student work through hand out on Webpage" "student enter HTML codes"
Decision Point	DP D-2/IVB "Refinement"	"Teacher assigns persons to work in groups of threes using laptop/desktop and IPad" "no internet, teacher uses offline web browser to view Webpage"

Observation 2 – Christine

Category	**Code/Decision Point**	**Emergent Theme**
Performing	Pe/D-1/IVA	"teacher instructs students to turn on laptops" "teacher guides students through character formatting" "teacher walks around room, making visual checks of activity" "students start page formatting guided by the teacher"
Decision Point	DP D-1/IVA "Routine Use"	"flash drives placed in machines" "student battery dies, teacher instructs the student to move closer to an outlet to charge laptop"

Axial Coding – Using Codes from the Behavioural Categories and Decision Points (Scheme of Work)

Christine

Category	**Code/Decision Point**	**Emergent Theme**
Planning	Pl/D-1/IVA	"document used to plan work during the term" "document used to create lesson plans"
Assessing	As/D-1/IVA	"mid term evaluation" "revision and evaluation" "end of term exam"
Performing	Pe/D-1/IVA	"creating a folder" "starting word" "entering text" "word wrap" "saving a document" "naming files" "closing and opening a document" "changing font type, size, colour, subscript, superscript, change case" "paragraph formatting, alignment, indentation, line spacing, bullets and numbering" "page layout, page orientation, setting margins, page numbering. "editing and proofing text, cut, copy, paste, find and replace, spelling and grammar checks,
Decision Point	D-1/IVA "Routine Use"	"document created every term for use by all form ones"

Cindy

Category	Code/Decision Point	Emergent Theme
Planning	Pl/D-1/IVA	"document used to plan work during the term" "document used to create lesson plans"
Assessing	As/D-1/IVA	"course work examination" "end of term examination"
Performing	Pe/D-1/IVA	"microsoft excel, charts and graphs, bar, line, pie, creating charts, inserting a chart title, adding axes, titles, saving charts in an existing worksheet, chart type, title tab, gridlines, legends, data labels, data tables, chart location"
Decision Point	D-1/IVA "Routine Use"	"document created every term for use by all form twos"

Maria

Category	Code/Decision Point	Emergent Theme
Planning	Pl/D-1/IVA	"document used to plan work during the term" "document used to create lesson plans"
Assessing	As/D-1/IVA	"homework assignment, PowerPoint presentation" "course work exams" "homework assignment, web page design" "end of term examination"
Performing	Pe/D-1/IVA	"Powerpoint presentation, moving slides, adding notes, slide master, animating your presentation, adding transition, printing your presentation" "creating a webpage using notepad, font, colours, underline, headings, use HTML, create lists, hyperlinks.
Decision Point	D-1/IVA "Routine Use"	"document created every term for use by all form threes"

Axial Coding – Using Codes from the Behavioural Categories and Decision Points (Interview)

Christine

	Question	**Category/code**	**Decision Point**	**Emergent Themes**
1	What do you see as the strengths and weaknesses of the innovation in your situation?	Assessing (As) Knowledge (Kn)	C/III C/III	Assessing: Strengths "the opportunity to own their own laptop" "no sharing" "homework can be done" "assignments can be done at home" Knowledge: Weakness "the students don't have internet access at school" "some do not have internet access at home" "there is no technician onsite to deal with the issues" "the network is not working" "the students don't bring it to school" "computer viruses"
1b.	Have you made any attempt to do anything about the weaknesses?	Assessing (As)	D-2/IVB	"the technician said that there was a problem with the server"
2a.	Are you currently looking for any information about the innovation? What kind? For what purpose?	Acquiring Information (Ac)	D-1/IVA	"like having field trips to connect what we are doing in the classroom with what is really going on outside"
3a.	Do you ever talk with others about the innovation? What do you tell them?	Sharing (Sh)	D-1/IVA	"I talk to Ms. M briefly and we have the same issues" "we talk about the advantages as well as the disadvantages"
4.	What do you see as being the effects of the innovation?	Assessing (As)	C/III	"greater interest in the subject area" "more willing to learn, they ask questions"
4a.	In what way have you determined this?	Assessing (As)	D-1/IVA	"general feedback from the students"
4b.	Are you doing any evaluating, either formally or informally,	Assessing (As)	NI	"no"

	Question	**Category/code**	**Decision Point**	**Emergent Themes**
	of your use of the innovation?			
4c.	Have you received any feedback from students?	Assessing (As)	C/III	"they will normally outline the problems"
4d.	What have you done with the information you get?	Assessing (As)	D-2/IVB	"refer them to the technician if he is on the compound"
5.	Have you made any changes recently in how you use the innovation? What? Why? How recently?	Status Reporting (St) Performing (Pe)	D-2/IVB D-2/IVB	"no" "the use of the multimedia at the beginning of this term"
5a.	Are you considering making any changes?	Status Reporting (St)	D-1/IVA	"at the moment, no"
6.	As you look ahead to later this year, what plans do you have in relation to your use of the innovation?	Status Reporting (St) Planning (Pl)	C/III D-1/IVA	"no plans" "probably I should implement some videos"
7.	Are you working with others (outside of anyone you may have worked with from the beginning) in your use of the innovation? Have you made any changes in your use of the innovation based on this coordination?	Status Reporting (St)	E/V	"like when we have workshops, you exchange ideas"
8.	Are you considering making or planning to make major modifications or to replace the innovation at this time?	Status Reporting (St)	C/III	"no"
9.	How do you work together? How frequently?	Performing (Pe)	D-1/IVA	"we work well together"
10.	What are the strengths and weaknesses of this collaboration for you?	Knowledge (Kn)	D-1/IVA	"the class is divided into two" "we have a smaller group, and with the smaller group it works well for me" "I will do form one lesson plans as well as the exam"

	Question	Category/code	Decision Point	Emergent Themes
				"we split up the responsibilities"
11.	Are you looking for any particular kind of information in relation to this collaboration?	Acquiring Information (Ac)	D-1/IVA	"the collaboration is minimal and limited to the teachers in the department" "when I go to a workshop, I share with others"
12.	When you talk to others about your collaboration, what do you share with them?	Sharing (Sh)	C/III	"just how we use the technology in the classroom" "Miss M and I was talking about the field trips" "she was talking about having a new piece of software like the Autocad to demonstrate it to the students"
13.	Have you done any formal or informal evaluation of how your collaboration is working?	Assessing (As)	C/III	"no we have not done any formal or informal assessments but I believe it is working"
14.	What plans do you have for this collaborative effort in the future?	Planning (Pl)	E/V	"see how we can further enhance the collaboration to make it better"
15.	Can you summarize for me where you see yourself right now in relation to the use of the innovation?	Status Reporting (St)	D-1/IVA	"between routine and refinement"

Cindy

	Question	Category/code	Decision Point	Emergent Themes
1	What do you see as the strengths and weaknesses of the innovation in your situation?	Assessing (As) Knowledge (Kn)	C/III C/III	Assessing: Strengths "students are interested" "they want to know more" Knowledge: Weakness "not using it the way it should" "they abuse it" "students might not have prior knowledge of how to properly use the device"

	Question	Category/code	Decision Point	Emergent Themes
				"in what time frame will it be repaired" "no projector" "no fixed room" "you lose teaching time" "only two period per day" "when students are timetabled on Fridays, and there are activities on Fridays, I miss my form threes"
1b.	Have you made any attempt to do anything about the weaknesses?	Assessing (As)	D-2/IVB	"I have been trying by instilling in them, simple as putting it in the laptop bag go that no damage is done to it"
2a.	Are you currently looking for any information about the innovation? What kind? For what purpose?	Acquiring Information (Ac)	D-1/IVA	"like lesson on Powerpoint, but it is not being utilized because of no projector"
3a.	Do you ever talk with others about the innovation? What do you tell them?	Sharing (Sh)	D-1/IVA	"not regularly"
4.	What do you see as being the effects of the innovation?	Assessing (As)	D-1/IVA	"not seeing any positive results from it"
4a.	In what way have you determined this?	Assessing (As)	NI	"no response"
4b.	Are you doing any evaluating, either formally or informally, of your use of the innovation?	Assessing (As)	C/III	"I started to use the projector but because of limited resources and I did not see a change in internet"
4c.	Have you received any feedback from students?	Assessing (As)	C/III	"a number of complaints is bringing it to school and it heavy about like virus and it's not working and damages to it"
4d.	What have you done with the information you get?	Assessing (As)	D-2/IVB	"inform the IT technician and speak with Miss D because we have the same group"
5.	Have you made any changes recently in how you use the innovation?	Status Reporting (St) Performing (Pe)	D-2/IVB D-2/IVB	"Yeah, I do that"

	Question	**Category/code**	**Decision Point**	**Emergent Themes**
	What? Why? How recently?			"I have started to take the projector into the classroom, so instructional step by step"
5a.	Are you considering making any changes?	Status Reporting (St)	NI	"no response"
6.	As you look ahead to later this year, what plans do you have in relation to your use of the innovation?	Status Reporting (St) Planning (Pl)	C/III	"no plans"
7.	Are you working with others (outside of anyone you may have worked with from the beginning) in your use of the innovation? Have you made any changes in your use of the innovation based on this coordination?	Status Reporting (St)	E/V	"not working with others only working with teachers within the school to develop text and scheme of work"
8.	Are you considering making or planning to make major modifications or to replace the innovation at this time?	Status Reporting (St)	C/III	"I have no plans to make major modifications"
9.	How do you work together? How frequently?	Performing (Pe)	D-1/IVA	"we work well together"
10.	What are the strengths and weaknesses of this collaboration for you?	Knowledge (Kn)	D-1/IVA	"we talk about scheduling and test setting, standardised assessment" "no weaknesses"
11.	Are you looking for any particular kind of information in relation to this collaboration?	Acquiring Information (Ac)	D-1/IVA	"well Ms. D and I spoke about the possibility of carrying children out on field trips to see how technology is being used in the workplace"
12.	When you talk to others about your collaboration, what do you share with them?	Sharing (Sh)	NI	"no response"
13.	Have you done any formal or informal	Assessing (As)	C/III	"no evaluation done"

	Question	Category/code	Decision Point	Emergent Themes
	evaluation of how your collaboration is working?			
14.	What plans do you have for this collaborative effort in the future?	Planning (Pl)	E/V	"looking into the possibility of going on field trips"
15.	Can you summarize for me where you see yourself right now in relation to the use of the innovation?	Status Reporting (St)	D-1/IVA	"I will continue to use the innovation but I believe the issues may limit how this is to be done"

Maria

	Question	Category/code	Decision Point	Emergent Themes
1	What do you see as the strengths and weaknesses of the innovation in your situation?	Assessing (As) Knowledge (Kn)	C/III C/III	Assessing: Strengths "we have the resources in school" Knowledge: Weakness "they don't have enough resources" "5% of laptops working out of 20 in 3L" "no internet access"
1b.	Have you made any attempt to do anything about the weaknesses?	Assessing (As)	D-2/IVB	"I copy the exercise" "inform parents" "inform administration, the technician, students"
2a.	Are you currently looking for any information about the innovation? What kind? For what purpose?	Acquiring Information (Ac)	NI	"no response"
3a.	Do you ever talk with others about the innovation? What do you tell them?	Sharing (Sh)	D-1/IVA	"talk about the problems" "I would ask like different people"
4.	What do you see as being the effects of the innovation?	Assessing (As)	C/III	"to complete their projects, interactive work, more groupwork"
4a.	In what way have you determined this?	Assessing (As)	D-1/IVA	"this is just observational"

	Question	**Category/code**	**Decision Point**	**Emergent Themes**
4b.	Are you doing any evaluating, either formally or informally, of your use of the innovation?	Assessing (As)	C/III	"oh yeah, but not really with the laptops" "we hardly have laptops, so we using desktops for who don't have laptops"
4c.	Have you received any feedback from students?	Assessing (As)	C/III	"they say the laptops not working, parents can't afford to fix the laptops, no technician available to fix the laptops"
4d.	What have you done with the information you get?	Assessing (As)	D-2/IVB	"I have reported this information to administration and even the IT technician with no help"
5.	Have you made any changes recently in how you use the innovation? What? Why? How recently?	Status Reporting (St) Performing (Pe)	D-2/IVB D-2/IVB	"the desktop help out" "so those who have it I will ask them to bring their IPad" "I usually demonstrate a lot and then well four to a desktop to show how to develop web pages" "so they can type in notepad"
5a.	Are you considering making any changes?	Status Reporting (St)	D-1/IVA	"the IT technician is saying it is really up to the parents"
6.	As you look ahead to later this year, what plans do you have in relation to your use of the innovation?	Status Reporting (St) Planning (Pl)	C/III D-1/IVA	"None" "administration will just have to buy desktops for the lab"
7.	Are you working with others (outside of anyone you may have worked with from the beginning) in your use of the innovation? Have you made any changes in your use of the innovation based on this coordination?	Status Reporting (St)	C/III	"I am not really working with others or sharing anything with persons outside" "we have no laptops"
8.	Are you considering making or planning to make major modifications or to replace the innovation at this time?	Status Reporting (St)	C/III	"to fix the desktops because he can't interfere with the laptops"

	Question	**Category/code**	**Decision Point**	**Emergent Themes**
9.	How do you work together? How frequently?	Performing (Pe)	D-1/IVA	"well we have half and half and am, the same scheme of work" "discussions are usually held casually on the corridor"
10.	What are the strengths and weaknesses of this collaboration for you?	Knowledge (Kn)	D-1/IVA	"well we able to cover the scheme of work for the entire term" "we discuss like the weakness if we need to set a particular class different, based on what topics"
11.	Are you looking for any particular kind of information in relation to this collaboration?	Acquiring Information (Ac)	D-1/IVA	"well, we usually discuss like when workshops come up and different issues"
12.	When you talk to others about your collaboration, what do you share with them?	Sharing (Sh)	NI	"no response"
13.	Have you done any formal or informal evaluation of how your collaboration is working?	Assessing (As)	F/VI	"well, in terms of timetabling" "if we request, like the AV room another teacher will be in there" "a new thing came out that you cannot book like two weeks in advance" "in terms of the numbers its already 28, 29 periods per teacher so, it is difficult to timetable extra time"
14.	What plans do you have for this collaborative effort in the future?	Planning (Pl)	E/V	"get more timetabling"
15.	Can you summarize for me where you see yourself right now in relation to the use of the innovation?	Status Reporting (St)	F/VI	"nothing, so basically, I depend on the school desktop to get technology"

Appendix L: Selective Coding

Selective Coding – Comparing Behavioural Categories with Decision Points to Determine Overall Levels of Use

Christine

Core Behavioural Category	Interview Questions/Scheme of Work/Observations/ Decision Points	Overall Levels of Use according to Behavioural Category
Knowledge	Q1 – C/III Q10 – D-1/IVA	D-1/IVA
Acquiring Information	Q2a. – D-1/IVA Q11 – D-1/IVA	D-1/IVA
Sharing	Q3a. – C/III Q12 – C/III	D-1/IVA
Assessing	Q1 – C/III Q1b. - D-2/IVB Q4 – C/III Q4a. – D-1/IVA Q4b – NI Q4c. – C/III Q4d. – D-2/IVB Q13. – C/III SOW – D-1/IVA	C/III
Planning	Q6 – C/III Q14 – E/V SOW – D-1/IVA	D-1/IVA
Status Reporting	Q5 – D-2/IVB Q5a. – D-1/IVA Q6 – C/III Q7 – E/V Q8 – C/III Q15 – D-1/IVA	D-1/IVA
Performing	Q5 – D-2/IVB Q9 – D-1/IVA SOW – D-1/IVA Observation – D-1/IVA	D-1/IVA
Overall level of Use		**D-1/IVA**

Cindy

Core Behavioural Category	Question/Decision Points	Overall Levels of Use according to Behavioural Category
Knowledge	Q1 – C/III Q10 – D-1/IVA	D-1/IVA
Acquiring Information	Q2a. – D-1/IVA Q11 – D-1/IVA	D-1/IVA
Sharing	Q3a. – C/III Q12 – NI	C/III
Assessing	Q1 – C/III Q1b. - C/III Q4 – C/III Q4a. – NI Q4b – C/III Q4c. – C/III Q4d. – D-2/IVB Q13. – C/III SOW – D-1/IVA	C/III
Planning	Q6 – C/III Q14 – E/V SOW – D-1/IVA	D-1/IVA
Status Reporting	Q5 – D-2/IVB Q5a. – NI Q6 – C/III Q7 – E/V Q8 – C/III Q15 – D-1/IVA	C/III
Performing	Q5 – D-2/IVB Q9 – D-1/IVA SOW – D-1/IVA	D-1/IVA
Overall level of Use		**D-1/IVA**

Maria

Core Behavioural Category	Question/Decision Points	Overall Levels of Use according to Behavioural Category
Knowledge	Q1 – C/III Q10 – D-1/IVA	D-1/IVA
Acquiring Information	Q2a. – NI Q11 – D-1/IVA	C/III
Sharing	Q3a. – C/III Q12 – NI	C/III
Assessing	Q1 – C/III Q1b. - D-2/IVB Q4 – C/III Q4a. – D-1/IVA Q4b – C/III Q4c. – C/III Q4d. – D-2/IVB Q13. – F/VI SOW – D-1/IVA	C/III
Planning	Q6 – D-1/IVA Q14 – E/V SOW – D-1/IVA	D-1/IVA
Status Reporting	Q5 – D-2/IVB Q5a. – D-1/IVA Q6 – C/III Q7 – C/III Q8 – C/III Q15 – F/VI	F/V
Performing	Q5 – D-2/IVB Q9 – D-1/IVA SOW – D-1/IVA Observation – D-2/IVB	D-2/IVB
Overall level of Use		

Appendix M: Levels of Use Rating Sheet

RQ: How do teachers at OLHS use the eCAL laptop programme within the classroom?

Appendix B
The LoU Rating Sheet

LEVEL OF USE RATING SHEET (CBAM, 1975)
Tape #: form 3 Site: OLHS Interviewer: RPhillips
Date: / / I.D.#: Rater:

Level	Knowledge	Acquiring Information	Sharing	Assessing	Planning	Status Reporting	Performing	Overall LoU
Nonuse	0	0	0	0	0	0	0	0
Decision Point A								
Orientation	I	I	I	I	I	I	I	I
Decision Point B								
Preparation	II	II	II	II	II	II	II	II
Decision Point C								
Mechanical Use	III	III	III	III	III	III	III	III
Decision Point D-1								
Routine	IVA	IVA	IVA	IVA	IVA	IVA	IVA	IVA
Decision Point D-2								
Refinement	IVB	IVB	IVB	IVB	IVB	IVB	IVB	IVB
Decision Point E								
Integration	V	V	V	V	V	V	V	V
Decision Point F								
Renewal	VI	VI	VI	VI	VI	VI	VI	VI
User is not doing:	ND	ND	ND	ND	ND	ND	ND	
No information in interview:	NI	NI	NI	NI	NI	NI	NI	

Is the individual a past user? Yes No If so, what was their last LoU? _____

How much difficulty did you have in assigning this person to a specific LoU? None 1 2 3 4 5 6 7 Very much

Comments about interviewer—

General comments—

Source: Hall, Dirksen & George (2006). Measuring Implementation in Schools: Levels of Use

Appendix N: An example of the analysis of the interview data

Question: Have you made any changes recently in how you use the innovation? What? Why? How recently? Are you considering making any changes?

Form 1 Teacher:

> No, because as I said before, I started of like just am we will read the book, the text book, initially, we would have read the text book and I would tell them what to do in terms of the steps to follow if you want to create a folder etc, etc, but now as we have the use of the AV room, I actually show them using my laptop, the exercise right so that is the only addition that I have used, the use of the multimedia at the beginning of this term". "At the moment, no"

Yellow highlight: teacher provides a status on what she is doing in the classroom (*code:St*)

Green highlight: teacher indicates moments of performance in the class (*code: Pe*)

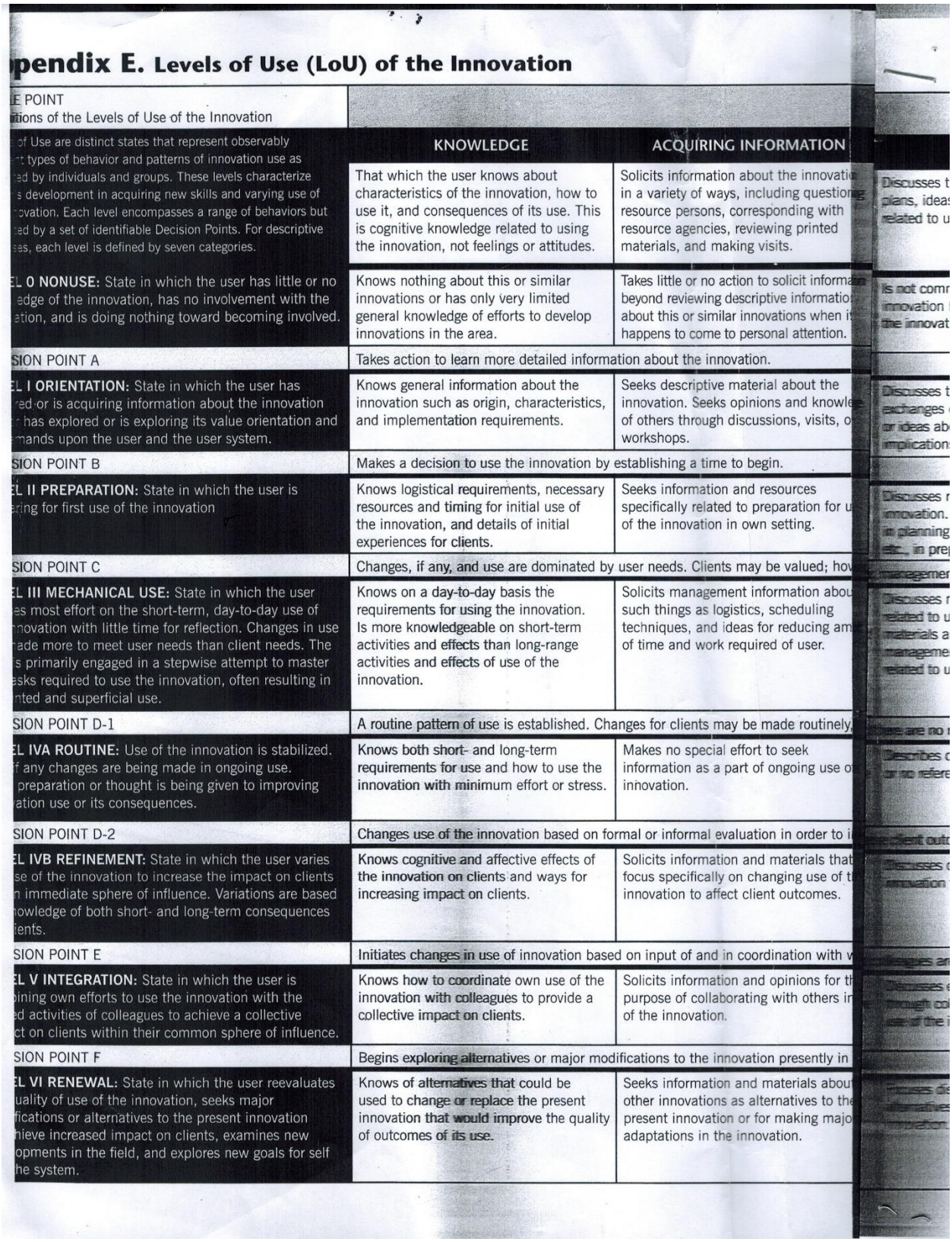
***Analysis**:* For LoU IVA (Routine) in the Status Reporting and Performing Categories, the teacher "varied the use within the classroom only as a part of her established way of doing things". The above discourse was coded under LoU IVA (Routine) for Status Reporting and Performing Categories. This was because although the teacher was reporting changes in her mode of delivery within the classroom, there was no evidence to suggest that she was using the laptops to enhance the learning environment, neither was there any indication that she was considering to make changes in the future.

Codes assigned: Routine Level of Use in Status Reporting and Performing Categories *(LoU – D-1/IVA/St and Pe*)

Appendix O: Colour Coding Scheme

Code/behavioural category	**Colour scheme**
As (assessing)	Blue
Ac (acquiring Information)	Grey
Sh (sharing)	Teal
St (status reporting)	Yellow
Pl (planning)	Violet
Kn (knowledge)	Pink
DP (decision point)	Red

Appendix P: Levels of use of the innovation comparative chart



pendix E. Levels of Use (LoU) of the Innovation

E POINT itions of the Levels of Use of the Innovation	KNOWLEDGE	ACQUIRING INFORMATION
of Use are distinct states that represent observably t types of behavior and patterns of innovation use as ed by individuals and groups. These levels characterize s development in acquiring new skills and varying use of ovation. Each level encompasses a range of behaviors but ed by a set of identifiable Decision Points. For descriptive es, each level is defined by seven categories.	That which the user knows about characteristics of the innovation, how to use it, and consequences of its use. This is cognitive knowledge related to using the innovation, not feelings or attitudes.	Solicits information about the innovatio in a variety of ways, including questioning resource persons, corresponding with resource agencies, reviewing printed materials, and making visits.
L 0 NONUSE: State in which the user has little or no edge of the innovation, has no involvement with the tion, and is doing nothing toward becoming involved.	Knows nothing about this or similar innovations or has only very limited general knowledge of efforts to develop innovations in the area.	Takes little or no action to solicit informa beyond reviewing descriptive informatio about this or similar innovations when it happens to come to personal attention.
SION POINT A	Takes action to learn more detailed information about the innovation.	
L I ORIENTATION: State in which the user has ed or is acquiring information about the innovation has explored or is exploring its value orientation and mands upon the user and the user system.	Knows general information about the innovation such as origin, characteristics, and implementation requirements.	Seeks descriptive material about the innovation. Seeks opinions and knowle of others through discussions, visits, o workshops.
SION POINT B	Makes a decision to use the innovation by establishing a time to begin.	
L II PREPARATION: State in which the user is ring for first use of the innovation	Knows logistical requirements, necessary resources and timing for initial use of the innovation, and details of initial experiences for clients.	Seeks information and resources specifically related to preparation for u of the innovation in own setting.
SION POINT C	Changes, if any, and use are dominated by user needs. Clients may be valued; hov	
L III MECHANICAL USE: State in which the user es most effort on the short-term, day-to-day use of novation with little time for reflection. Changes in use ade more to meet user needs than client needs. The s primarily engaged in a stepwise attempt to master sks required to use the innovation, often resulting in nted and superficial use.	Knows on a day-to-day basis the requirements for using the innovation. Is more knowledgeable on short-term activities and effects than long-range activities and effects of use of the innovation.	Solicits management information abou such things as logistics, scheduling techniques, and ideas for reducing am of time and work required of user.
SION POINT D-1	A routine pattern of use is established. Changes for clients may be made routinely,	
L IVA ROUTINE: Use of the innovation is stabilized. f any changes are being made in ongoing use. preparation or thought is being given to improving ation use or its consequences.	Knows both short- and long-term requirements for use and how to use the innovation with minimum effort or stress.	Makes no special effort to seek information as a part of ongoing use o innovation.
SION POINT D-2	Changes use of the innovation based on formal or informal evaluation in order to i	
L IVB REFINEMENT: State in which the user varies se of the innovation to increase the impact on clients immediate sphere of influence. Variations are based owledge of both short- and long-term consequences ients.	Knows cognitive and affective effects of the innovation on clients and ways for increasing impact on clients.	Solicits information and materials that focus specifically on changing use of t innovation to affect client outcomes.
SION POINT E	Initiates changes in use of innovation based on input of and in coordination with v	
L V INTEGRATION: State in which the user is ining own efforts to use the innovation with the d activities of colleagues to achieve a collective ct on clients within their common sphere of influence.	Knows how to coordinate own use of the innovation with colleagues to provide a collective impact on clients.	Solicits information and opinions for th purpose of collaborating with others in of the innovation.
SION POINT F	Begins exploring alternatives or major modifications to the innovation presently in	
L VI RENEWAL: State in which the user reevaluates uality of use of the innovation, seeks major fications or alternatives to the present innovation hieve increased impact on clients, examines new opments in the field, and explores new goals for self he system.	Knows of alternatives that could be used to change or replace the present innovation that would improve the quality of outcomes of its use.	Seeks information and materials about other innovations as alternatives to the present innovation or for making majo adaptations in the innovation.