✍ Chapter 3 – Research Design and Methodology

*This chapter describes the research methodology that was used in the study. A **qualitative research method** was used to understand the interactions between multiple intelligences and the performance of learners as they engaged in the open-ended digital learning tasks that were constructed to accommodate the research design. The chapter reviews and describes in detail the different data collection strategies that were used in the study. These include open-ended-digital learning tasks, observations, scoring rubrics, questionnaire and interviews. This is followed by an explanation of the data analysis procedure, the interpretive method that was used. The chapter concludes with an explanation of the different validity and reliability measures that were implemented during the study as well as a consideration of ethical issues.*

3.1 Introduction

In the literature review in chapter 2, I gathered, assessed and analysed the information that constitute the guidelines that will inform this chapter about the theory of multiple intelligences. In the first place, I described and reviewed Gardner's theory of multiple intelligences that challenges the conventional and widely applied view of intelligence as a unitary capacity that reflects the verbal-linguistic and logic-mathematical aptitudes that are measured in traditional IQ tests.

Gardner (1983) then posited the theory that intelligence is pluralistic and that everybody has at least eight intelligences. Gardner (1983) then defined intelligence as an ability to use at least eight forms of intelligence to solve problems or create products that are valued in a particular culture. These eight intelligences reflect the different ways in which learners interact with the world. If teachers want to give their learners the greatest possible scope for their learning activities and personality development in the school situation, then they have to develop strategies to structure learning activities around problems and projects that will give learners a sufficient number of opportunities to demonstrate these skills and understanding in ways that reflect all eight intelligences. Such strategies should also be designed to evoke the uniqueness of each learner. Such a system implies that learning activities have to be developed should give evidence of a variety of learning preferences and abilities – as

opposed to those that are only able to give evidence of logical-mathematical and verbal-linguistic intelligences.

Kornhaber, Krechevsky and Gardner (1990, p. 192) argued that if one hopes to obtain a rounded and comprehensive summation of the multiple intelligences of learners as posited by Gardner's theory of multiple intelligences, then one needs to adopt an 'intelligence fair' assessment process. By this they meant that the assessment processes that are to be used should be 'fair' to the learner who is being assessed. That is the assessors should be certain that the assessment instruments have sufficient capacity and diversity to allow learners to demonstrate all their eight intelligences by using intelligence-appropriate media and contexts rather than by relying exclusively on paper and pencil tests, and short answer questions. This can be done by use of alternative assessment or performance assessment.

Alternative assessment or performance assessment can be used to allow learners to demonstrate their capabilities directly by creating some product or engaging in some activity (Gardner, 1983; Haertel, 1992). Performance assessment process relies heavily on the assessor's observation and professional judgment of learners' products and responses. Mehrens (1992) suggests that the best way to achieve the expected results with accuracy, reliability and the possibility of replicability by other assessors is by using scoring rubrics. It should be noted that when ***alternative assessment*** is mentioned in this study, the phrase refers to the assessment of learners' performances (abilities) while they are working on open-ended digital learning tasks and so revealing the unique combinations of their multiple intelligences.

Therefore, the aim of this research study is to investigate the interaction between multiple intelligences and performance of the learners in open-ended digital learning tasks by using performance assessment process in a classroom situation. The study explores how learners with different intelligences engage in or execute open-ended digital learning tasks provided.

3.2 Theoretical framework – concepts on performance assessment

In this study, I conceptualise ***performance assessment*** as a set of open-ended digital learning tasks, and assessment instruments. These assessment instruments comprise a multiple intelligence survey questionnaire, a school progress report, scoring rubrics, observation checklists and assessment framework that use the concepts of the theory of multiple intelligences. The following figure exhibits the linkages between the open-ended digital learning tasks and the assessment instruments and how they are used together to produce performance assessment.

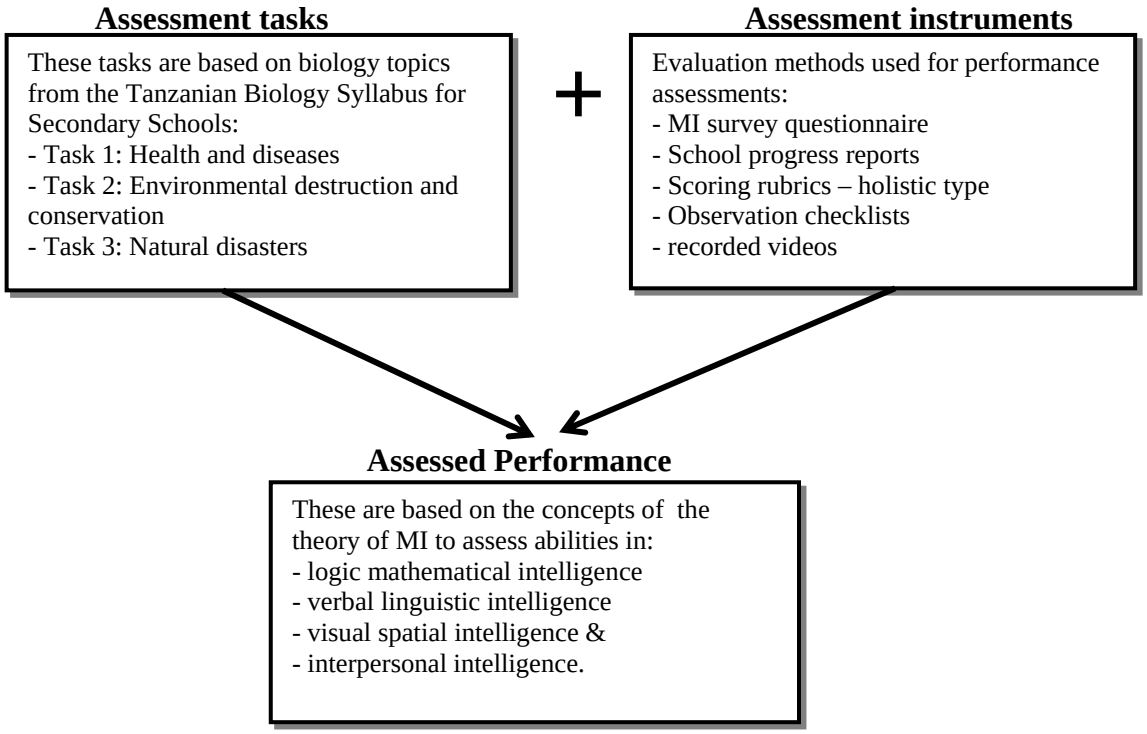

Figure 3.1: A conceptual framework of performance assessments.

The characteristics of tasks and assessment methods determine the performance assessments that were used in the study. The analysis in this section will be conducted in terms of the following subsections:

1. *Assessments tasks.* These include three open-ended digital learning tasks that present the learners with authentic tasks that they have to complete by using their skills and by engaging in social interactions that (all taken and considered together) will give evidence of ***all*** their multiple intelligences.

2. *Assessment instruments*. These include multiple intelligence survey questionnaire, school progress reports, holistic type of scoring rubrics, observation checklists, and recorded videos of learners working on open-ended digital learning tasks.
3. *Assessed performances*. These were constructed in terms of the concepts and performance abilities considered in the theory of multiple intelligences with preference to four intelligences these are: logic-mathematical, verbal-linguistic, visual-spatial and interpersonal intelligences.

3.3 Research design

The research design that I chose for this study is a **qualitative research approach.** Qualitative research was chosen in order to get an understanding of the interactions between multiple intelligences and performance of the learners in open-ended digital learning tasks by using performance assessment process in a classroom situation. Some of the data collection strategies that were used in the study include interviews, observations and questionnaires.

Data was gathered and used inductively to build concepts (Merriam, 2002) in an attempt to understand whether learners have performed according to their intelligence profiles and how learners perform across several intelligences when engaged in the same open-ended digital learning tasks.

I used Gardner's (1983) theory of multiple intelligences as an overarching theoretical framework in order to give the design of the data collection process coherence and plausibility. I collected the data in two main stages. In the first stage, I determined learners' intelligence profiles by using a multiple intelligence survey questionnaire and school progress report. In the second stage, I observed the learners as they worked on their open-ended digital learning tasks and then assessed the ways in which each learner performed and combined the information with the evidence that was contained in their task documents and presentations. I then interpreted the results of each learner's performance abilities in the open-ended digital learning tasks as they emerged as they worked on their tasks during the observation process. The interpretation of these results also included a ***descriptive approach*** that utilised a contingency table to describe the relationship between multiple intelligences and

learners' performances in open-ended digital tasks (Patton, 1990; Merriam, 1998; Creswell, 1998). I needed all this information and data so that I could answer the following critical question that is at the heart of my research study: ***How do learners with different intelligences engage in or execute open-ended digital learning tasks?***

3.3.1 Research paradigm

As I have already noted above, I selected an ***interpretive paradigm*** for the knowledge claim that I make in this study. The crucial point in this study is to understand how learners' intelligence preferences and performance abilities display themselves while they work on tasks – in this case, the open-ended digital learning tasks in a classroom situation that constitute this study. I had to search intensively before I found descriptions and explanations that would finally give proper shape to the data that I got from the study (Tashakkori & Teddlie, 2003).

My first problem was to consider the number of intelligences to which I would confine myself for the purposes of this study and what descriptions, performances and explanations I would regard as valid and sufficient for attesting to intelligences that I selected. For the purposes of the study, I focused on only four intelligences, namely, logical-mathematical, verbal-linguistic, visual-spatial and interpersonal. The selection of these four intelligences was based on the performance assessment procedures that I used in the design of the research. I felt that these intelligences could be accurately expressed by the authentic tasks elicited by the three open-ended digital learning tasks that I devised for the sample of learners. It required the learners in the sample to perform and complete these authentic tasks in a classroom situation by using only the resources that were available there (i.e. computers with no Internet connection).

The second problem that I had to consider is the one raised by Wiggins (1993) and relates to the expertise of the researcher and school teachers in such situations. If the researcher (or teachers), for example, do not have or do not possess any formal training in musical or kinaesthetic fields, how can they design instruments or experimental situations that will test such abilities? In the end, because of my own limitations, I based my assessment of the learners' performance abilities on a limited range of four kinds of intelligence that I knew I would be able to assess accurately and fairly. The intelligences that I selected to assess learners' abilities in this study were

verbal-linguistic, logic-mathematical, visual-spatial and interpersonal. I designed the research in such as way that learners could use these four intelligences as a prism through which they could assess the reflected intelligence strengths, weaknesses, strategies and skills as they performed on the open-ended digital learning tasks.

3.3.2 Data collection strategies

The data collecting instruments that I used in this study include semi-structured interviews, an observation checklist, semi-structured questionnaires and documents used for analysis (school progress reports, learner's task documents and presentation documents). I therefore used several data collection instruments to construct my understanding of the multiple perspectives that learners brought to the performance of their tasks (Creswell, 1998; Merriam, 2002).

Before embarking on the data collection process, ethical issues involving human participants were taken into account. First, a research clearance letter was attained from the University of Dar es Salaam, to allow me to conduct the study in the selected schools. Second, a letter from the Regional Education Officer in both Regions was used to gain access to the selected schools. Third, consent letters were used to ask permission of participation of the parents and the learners who participated in the study. More importantly, the ethical issues in this study included the confidentiality of all the participants, the informed consent of the parents/guardians of the learners who participated in the study, and a proper relationship among the researcher, the learners, the teachers, the parents, and the school administration. The identity of the schools and individuals who participated in the study have been protected because they were all allocated letters that informed them of the use of pseudonyms in the reporting phase of the study (Gall et al., 1996).

3.3.2.1 Stage 1 of data collection process – Multiple intelligences survey questionnaire and learners school progress reports

The first part of the data collection process required me to use a multiple intelligence survey questionnaire and the school progress reports of the learners in the sample to identify the multiple intelligence profiles of the learners who participated in the study.

(1) Learners' Multiple Intelligence Survey questionnaire

The multiple intelligence survey questionnaire used is a standard instrument that was used to determine a learner's multiple intelligence profile. I adapted my questionnaire from the one that is obtainable from McKenzie (1999) of Surf Aquarium Consulting (http://surfaquarium.com/MIinvent.htm). The inventory questionnaire was used to identify learner's strongest and weakest intelligences. In order to make the instrument applicable to Tanzanian conditions and learners, I had to make changes in some of the items so that they would suit the Tanzanian cultural context and the level of understanding of the learners in the sample. This, for example, I changed the original item "My home has a recycling system in place" to "In my home, we sometimes reuse some things such as bottles". I administered the multiple intelligence survey questionnaires to all 40 learners at the beginning of the study in each school.

(2) The learners' school progress report

I collected copies of the learners' school progress reports from all the schools that participated in the study. The progress reports recorded annual subject scores (marks or grades), and indicated the current level of academic attainment of the learner concerned. I used these school progress reports to validate the results that I obtained from the multiple intelligences survey test instrument. According to Armstrong (1998), Krechevsky (1998) and Teele (2000), a school progress report can provide important information about the learner's performance abilities in different intelligences. If, for example, a learner's grades are high in **mathematics** and the **sciences** (physics, chemistry and biology), and in **literature** (English and other languages), then the school progress report will tend to offer supportive and corroborative evidence of strength in logical-mathematical and verbal-linguistic intelligences (Gardner, 1993; Armstrong, 1998; Campbell, Campbell, & Dickinson, 2004).

3.3.2.2 Stage 2 of data collection process – Open-ended digital learning tasks, reading resources and saved documents

Before learners were given permission to begin working on their open-ended digital learning tasks, I held a collective preliminary session with all of them. In these sessions I carefully explained and taught some of the computer application skills that they would possibly need until each learner was proficient. These computer skills included *Microsoft Excel, Power Point* and *MS Word* (in which they were shown how

to use clip art, pictures, graphs and colours). I deliberately introduced computer application skills to the learners so that they would have a wider range of choices with which to express themselves as they worked on their open-ended digital learning tasks. At the same time it was an opportunity for the learners to learn new computer application skills that were not taught in these schools.

(1) Open -ended digital learning tasks

In preparing the open-ended digital learning tasks, I considered all aspects of the Biology syllabus for secondary schools in Tanzania (Forms 1-4 of 1996), and selected topics that I thought would be of interest and successfully investigated by the learners who participated in the study. I selected the following topics from the Biology syllabus: (a) health and prevention of diseases, (b) environmental degradation and conservation, (c) natural disasters and effects to the ecosystem. In my selection of the open-ended digital learning tasks, I also considered what importance and relevance the selected tasks would have on 'real-world' concerns outside the school environment and the extent to which they would therefore be ***authentic***. All these tasks engaged the learners with problems that are common in their communities in Tanzania and which are therefore authentic.

In completing these tasks, learners had to use their knowledge of Biology and computer skills to complete the tasks effectively and creatively. A total of three learning tasks were prepared from three different topics. These were: (1) The water in the community is infected with microbes – Don't drink the water!! Is it cholera or typhoid fever? (2) Waste disposal problem in the community – Landfill problems!! Air pollution and health hazards. (3) Ship disaster – The MV Bukoba Tragedy!! What can numbers tell us about her vital voyage?

These three open-ended digital learning tasks are further described in the following sections:

- **Task 1:** Don't drink the water!! Is it cholera or typhoid fever? Learners were asked to read the text resources provided about diseases and then choose one of the diseases for which they were asked to devise an educational strategy that they would use to educate their community on the transmission of microbes and/or

other infective agents, symptoms, treatment and the prevention of the disease. They had a choice of using a flyer, a poem, radio or television programme as their educational strategy.

- **Task 2:** Landfill problems!! Air pollution and health hazards. Learners were asked to read the resources on landfills and their effects on the environment. Their educational programme had to suggest the advantages and disadvantages of landfills, and suggest strongest reasons why a community should campaign against the beginning of any new landfill on their community land. They then had to plan a campaign that would galvanise their community to protest against a new landfill in their community by using either posters, letters to their village leaders, a community rally, or a radio programme.

- **Task 3:** The MV Bukoba Tragedy!! What can numbers tell us about her vital voyage? I purposely planned this task so that learners would have to find out the facts about how MV Bukoba disaster that occurred in 1996. They had to say how many people had died (divided into categories of men, women and children), and how many people survived. The learners were then required to write a story and present the data in tables and graphs, and also develop a plan of action that would suggest precautions and offer advice to the government on how they might prevent such tragedies in future. (For all the documents relating to these tasks, see appendix 3. 2).

I expected learners to complete all the three tasks that I prepared by using resources provided and the computers available in the schools. This necessary use of computers did not compel learners only to exercise their logical-mathematical intelligence because the tasks were unrelated to computer programming. For computer programming, learners need a good background in mathematics and they need to be able to reason logically. In this research, learners purposefully used the computers as a means for completing and presenting their tasks.

In the cause of action in checking the validity of the open-ended digital learning tasks developed, I utilised a computer program called **Flesch-Kincaid Grade Level Scores** to check whether the standard of the materials that I had prepared as a researcher were

suited to the grade level of the learners and whether the materials could be read and understood with ease. In both instances, the suitability was confirmed by this program.

(2) Reading resources used in the study

The researcher deliberately created these materials as a resource that learners could use if they needed help in the completion of their tasks as they worked on the computers. My first intention during the research design phase was to give all learners an opportunity to search for their own information on the Internet. But because none of the participating schools had functioning Internet connections, I decided, as an alternative, to collect whatever information they might need for preparing the tasks from different websites and to load this information onto CDs for learners. The reading resources they needed were thus available on CDs. But because the computers that the learners used did not have CD drives, I alternatively had to save all the reading resources on the CD onto the hard drives of their computers. The reading resources were intended (1) to stimulate the learners intellectually by giving them a central place to use their reading skills and ***intelligent selection of materials needed for their*** research activities, and (2) to compel learners to give evidence of ***self-management skills*** as they selected content that was relevant to their tasks.

(3) Saved documents - open-ended digital learning task documents and presentation documents

The learners saved all their documents on floppy disks and the data on these floppy disks was later printed and used during the assessment and analysis process. These printouts gave me a total of 112 documents. Fifty six of these contained the solutions to the open-ended digital learning task documents that the learners had typed in *Microsoft Word*. The other set of 56 documents comprised presentation documents that the learners had prepared on *Microsoft Power Point.*

3.3.2.3 Stage 3 of data collection process – observation process

(1) Observation checklist

I used a structured observation checklist with observable characteristics of intelligent behaviours to identify learners' performance abilities for **interpersonal intelligence**. The way in which I used this checklist for observations was firmly based on the concepts of the theory of multiple intelligences and the literature review that was done

on open-ended digital learning tasks. The checklist was used by me, the researcher, and by one of the school teachers (the co-observer) to observe learners as they worked at their open-ended digital learning tasks in each school.

Before the start of each observation, I arranged a preliminary session between the researcher (myself) and the teacher (the co-observer). In this session, we discussed how we would use the checklist, what it was that we might be observing, and the nature and general purpose of the observations that would arise out of the checklist. In this preliminary session, I gave the co-observer every opportunity to ask questions, criticise the procedure, and ask any questions that he/she might have about the process and the research design in general. I used a three-scale profile instrument to quantify interpersonal intelligence. This instrument allowed us to decide whether the learner's performance ability was high, medium or low (see appendix 3.3 for the checklist). If the learner scored 3 points in the interpersonal intelligence instrument, he or she was rated **high** in this form of intelligence. If the learner scored 2 points in the interpersonal intelligence instrument, he or she was rated **medium**, and if the learner scored 1 point, then he or she was rated as having a **low** interpersonal intelligence. I calculated an average score for each learner by taking all the three scores that each learner scored in each task (task 1, task 2 and task 3) and divided this by 3.

In total we (me the researcher and the teachers in each school) observed twelve sessions over three tasks each in schools M, N, O and P. All the observed tasks were completed by the learners by using computers that were already present and available in the computer laboratory in each school and that conformed to the research requirements. All the presentations that learners made were from their personal computers (PCs) on which the learners had constructed their presentations. As each learner gave his or her presentation, the other learners gathered around and had to listen to the presentation, ask questions, discuss what they had heard and seen. Once a particular group of learners has completed their presentation, all the learners moved on to the next computer, and so on. None of the schools in the sample had a data projector for presentation purposes and so could not be used in the study.

In order to ensure consistency of the data collected during observation, the researcher (myself) and the teacher (the co-observer) were engaged in a reflection session in

which we discussed each of our observations and any matters that arose from these observations. We also wrote up a small report on what we had observed while the events that we had witnessed were still fresh in the minds. I later combined and summarised all the events that pertained to each learner and rated him or her as having a high, medium or low intelligence according to the scales identified by the protocols. I also used the video recordings of activities to complement the observation field notes that were compiled by the teacher and myself (the researcher). During the analysis stage, all the video recordings were transcribed and coded and logically amalgamated with the field notes. All the codes were then sorted in terms of recurrent themes.

3.3.2.4 Stage 4 of data collection process – interviews and questionnaires

There also was another instrument to collect data for this study. This instrument was the semi-structured interview schedule. It consisted of interviews with teachers and parents in a face-to-face sessions and learners in focus group sessions. I used all these instruments sequentially during the data collection process (Tashakkori & Teddlie, 2003). I also followed the suggestion of Denzin (1988) and subjected the data to triangulation after having employed different data collection strategies as a method of ensuring validity. What follows is a discussion of each interview schedule.

(1) Focus group interviews with the learners

I conducted a face-to-face interview sessions with all the learners. All 40 learners took part in the focus group interviews. There were a total of 12 focus groups with three to four learners in each group. In each group, we had a 30-minute discussion that took place immediately after the completion of all three open-ended digital learning tasks that the learners had been asked to complete. The focus group discussions were conducted in the computer laboratory. This gave learners an opportunity to express their views about the use of computers as instructional tools, what computer skills they had learned, their views on the open-ended digital learning tasks that they had just completed, and their participation in and contribution to the learning tasks in terms of performance abilities and teamwork.

I used a semi-structured interview schedule and utilised questions that I had derived from the multiple intelligence theoretical frameworks and the literature review. All

the discussions were recorded on video and audiocassettes, which were later transcribed for analysis. All important information identified in the transcripts were highlighted, coded and sorted according to different and recurrent themes. This categorisation process was important for bringing together and giving coherence to the meaning of the data collected (Ryan & Bernard, 2000). The interview schedule that I used can be viewed in appendix 3.4.

(2) Teacher interview

I based the teacher interview schedule around the activities that learners performed in class as they completed the open-ended digital learning tasks, presentations and performance assessment activities. The interview questions in this interview were semi-structured and they gave me an opportunity to probe for more information (see appendix 3.5 for the interview schedule). I used the interview schedule to obtain teachers' views about the learners' performance abilities because they had observed the learners working on the open-ended digital learning tasks and their presentations. I questioned teachers about their views in relation to the particular pedagogy that was used – a pedagogy that made use of authentic tasks and computers, and assessment procedures that made use of rubrics, observation of learner's performances in interpersonal intelligence and computer application skills and collection of the open-ended digital learning task documents.

The interview was arranged into a face-to-face session between the researcher and the teachers. I conducted these interviews with individual teachers in their schools immediately after the learners had all completed their last open-ended digital learning task. The interview sessions were 20 minutes long for each teacher, and with his or her permission I recorded all the interviews on a cassette recorder and later transcribed them for analysis. After all the interviews had been transcribed, I coded all the responses that they had made to different questions. After all the statements from different participants had been coded, I made the final analysis.

(3) Teacher demographic questionnaire

This questionnaire, which I prepared for all the four teachers involved, was a structured questionnaire. I used this questionnaire to obtain the biographical data of the teachers concerned. The instrument was developed by the researcher and contained six items. The information that was collected included the academic

qualifications of the teachers, their teaching experience and their teaching subjects. The questionnaire was administered to all four teachers immediately after the observation sessions. Appendix 3.6 contains a sample of the questionnaire. The analysis of the questionnaire was collated with the results of the interviews.

(4) Parent interview

The interview questions in this interview were semi-structured and it gave me an opportunity to probe for more information about the learners' background and performance abilities from the parent's point of view (see appendix 3.7 for the parent's interview schedule). I used the interview schedule to obtain parents' views about the learners' performance abilities because they know their children and they have observed their children since they were small. I questioned the parents about their views in relation to the particular behaviour or performance ability that is obvious in their children, how do they help them support this performance ability and what are their future plans for their children.

The interview was arranged so that it consisted of a face-to-face session between the researcher and the parents. I conducted these interviews with individual parents in their offices and sometimes at their homes. The interview sessions were 20 minutes long for each parent and with their permission I recorded all the interviews on a cassette recorder and later transcribed them for analysis. After all the interviews had been transcribed, I coded all the responses that they had made to different questions. After all the statements from different participants had been coded, I made the final analysis.

(5) Parent demographic questionnaire

This questionnaire, which I prepared, was given to all parents involved in the study. The questionnaire was a structured questionnaire. I used this questionnaire to obtain the biographical data of the parents concerned. The instrument was developed by the researcher and contained six items. The information that was collected included the academic qualifications of the parents, their working experience in years and their residential areas. The questionnaire was administered to ten parents after they have completed the interview session. All the parents where from Dar es Salaam Region. Appendix 3.8 contains a sample of the questionnaire. The analysis of the questionnaire was brought together with the results of the interviews.

3.3.2.5 Stage 5 of data collection process - Assessment of learners' performance abilities using holistic scoring rubrics

I used performance assessment procedures to assess the open-ended digital learning task documents and presentations of the learners. A performance assessment procedure was characterised by a variety of evaluation strategies that maximise learners' opportunities to display what they actually know in ways that are familiar to them (Moll, 1988; Ortiz & Maldonado-Colon, 1986, p. 265). The evaluation strategies that I used in this study included observation checklists, scoring rubrics, video recordings, and field notes. The purpose of the performance assessment process was to trace whatever performance patterns might be exhibited by learners as they worked on the open-ended digital learning tasks. The emphasis in this process was on the ***consistency*** of the learners' performance abilities (intelligences) as they used their Biology knowledge and computer application skills in all three tasks. Observation checklist was used to assess the learners' performance abilities in interpersonal intelligence as they worked on the open-ended digital learning tasks.

(1) Holistic scoring rubrics

A holistic type of scoring rubric (see appendix 3.9) was used to score the task documents and presentations that were saved on floppy disks by the learners themselves. After scoring all the documents in each task, I calculated an overall average score from the three open-ended digital learning task documents and the Power Point presentation documents of each individual learner. The average scores were then grouped into three performance categories, which were: **above average** (AA), **average** (A), and **below average** (BA). If a learner's average score was 2.5–3, he/she was categorised as being above average, whereas 1.5–2.4 meant average, and 1.0–1.4 meant below average. To avoid biases during the analysis of the learner's task documents, the four teachers together with the researcher calculated an inter-rater reliability coefficient for all the tasks that were marked.

3.4 Research methodology

3.4.1 Study profile Geographical context

The study was conducted in four urban secondary schools in Tanzania. Three of these schools were government secondary schools in the Dar es Salaam Region, two of the schools were in the Ilala District, and the third school in the Temeke District. The

fourth school was a private school in Iringa Region. Iringa Region is situated in the southern part of Tanzania.

3.4.2 Sampling - schools, learners and teachers

The context and purpose of this study required learners to use their Biology knowledge and computer application skills. It was therefore necessary to find schools that had computer laboratories and learners who were taking computer studies as a course to participate in the study. I used a *purposive sampling strategy* to select the sample of schools and the sample of learners who ultimately participated in the study (Tashakkori & Teddlie, 2003). The criteria that I used were that the schools concerned should have enough computers (that is between 10-20 computers) and that the learners concerned should have enrolled for and be participating in computer courses.

The learners would have to use these computers to complete three open-ended digital learning tasks. Because I found that most of the government secondary schools that I visited during the study did not have more than ten working computers and not more than ten learners who were doing computer studies as part of their courses in forms two and three, I was forced to select four different secondary schools to participate in the study. From these I was able to select a requisite number of learners who would be able to provide the information that I needed to shed light on the research question under study (Patton, 1990). I therefore selected four schools for the study. All of these schools had at least one computer laboratory with more than six working computers in them at the time of the study. The identity of the schools used in the study is shown in Table 3.1.

Table 3.1: Schools that participated in the study

School	District	Ownership	New name
Coeducational	Ilala	Government	**M**
Coeducational	Temeke	Government	**N**
A girls' school	Ilala	Government	**O**
Coeducational	Iringa urban	Private	**P**

All the government schools that participated in the study had computer laboratories that were privately owned. In each case, a private operator had bought and installed

all the computers and printers as a business venture, while the school itself had provided a room to serve as the computer laboratory. Computer studies as a subject was then offered to learners on commercial (private payment) basis. This meant that any learner who wanted to do or take computer studies as a course had to pay a fee to the owner of the computers. The fees for the computer course varied from school to school (they are as shown in Table 3.2). As a result presumably of this added expense, very few learners had enrolled in computer studies in the higher classes.

Between nine and eleven learners from each of the research schools voluntarily agreed to participate in the study, thus making a sample total of 40 learners. Twenty learners were in Form 2 and 20 learners were in Form 3. Of these, 23 were female and 17 were male learners. The age distribution of the learners ranged from between 13 and 19 years.

Four teachers, one teacher from each school, were involved in the research study as co-observers. My initial plan in the design phase was to get two biology teachers from each school who were responsible in teaching these learners biology course to participate in the study. But since, as it has been noted above, the computer laboratories were privately owned, most teachers were not allowed into the computer laboratories in terms of the agreement between the computer owners and the schools themselves. Three of the teachers who participated in the study were teachers who taught mathematics and computer studies. The fourth teacher was the only one who taught biology and chemistry. These teachers participated in this study as co-observers engaged in specific tasks during the presentation sessions and while the learners worked on their open-ended digital learning tasks. These same four teachers also participated in the reflection sessions with the researcher. Table 3.2 provides the summary of information about the schools, the learners and the teachers who participated in the study.

Table 3.2: Summary of information about the schools, the learners and the teachers

Details	School – M Teacher (Tm)	School – N Teacher (Tn)	School – O Teacher (To)	School – P Teacher (Tp)
Learners' education level	Form II	Form II	Form III	Form III
Number of learners	11	09	10	10
Age of the learners (in years)	13 - 16	14 - 18	13 - 17	14 - 19
Gender of the learners	Females 7 Males 4	Males 9	Females 10	Females 6 Males 4
Computer literacy of learners	Basic skills	Basic skills	Basic skills	Basic skills
Completed tasks per school	3 (three)	3 (three)	3 (three)	3 (three)
Hours spent working on learning tasks	04 hrs/day	04hrs/day	04 hrs/day	04hrs/day
Duration (days)	15	15	15	14
Computer studies fees in TShs per annum	40,000.00 or US$36.00	30,000.00 or US$27.00	20,000.00 or US$18.00	15,000.00 or US$13.00
Internet connection	No connection	No connection	No connection	No connection
Teacher's educational qualification	Diploma in Education	Diploma in Education	Certificate in Information Technology	Diploma in Education
Teaching experience (in years)	18	16	02	05
Gender of the teacher	Female	Male	Male	Male

Note: Rate for US $ was calculated on the date when the study was done.

3.4.3 Implementation of the tasks

The time taken to complete the data collection process was four months, and that was between December 2003 and March 2004. I spent five working days per week over three weeks in each school. In each research venue, the learners were all given the materials that they needed for the open-ended digital learning tasks in hard copy in a flat file, and the reading resources were saved for them electronically to their computer hard drives. The reading resources were saved onto the hard drives because most of the computers were old and did not have CD drives. Some of the computers that did have CD drives could not read the CDs that had been prepared for the study. The computer literacy of the learners was considered to be ***basic*** in terms of the syllabus that was being followed in the schools. Each group of learners that participated in the study came from the same class, that is, from Form 2 or Form 3. It was therefore assumed that they all possessed the same level of biology content knowledge and were roughly equally proficient in computer literacy skills.

Before the study was conducted, all the correct official procedures were adhered to. Heads of schools were informed about the study, and in each case they have their official permission to the researcher to proceed. As the study needed the participation of the learners for more than 3 hours per day after school hours, it was necessary also to obtain the consent of the parents or legal guardians of the learners who participated in the study. Written permission was also obtained from the owners of the computer facilities because the learners were using the computers after school hours. In both cases, such permission was granted.

In general, the administration at the various schools was supportive. Although some of the teachers were interested in the study, they explained that they would be unable to apply computer technology in their classrooms because they did not have access to the computer laboratory. They also said that they were computer illiterate and that there were no government plans to train them in computer skills in the future. Since the government has failed to provide the schools with computers, computer courses had been commercialised and were therefore only available to those who could afford to pay for them. Many teachers themselves could not also afford to pay for the computer courses on offer and this was a source of great frustration to most of them.

3.5 Data analysis procedures

Together with all those collaborating in the study, I collected data over a four-month period by using all the instruments that have already been mentioned. The data analysis process in this study followed an **interpretational analysis approach.** This means that the data was analysed by interpreting the identified significant repetitive emergent patterns, constructs, and themes (Tesch, 1990; as cited in Gall et al., 1996). The data itself was obtained from the multiple intelligence survey questionnaires, school progress reports, open-ended digital learning task documents and presentations, interviews, and observation checklists that identified how learners revealed their multiple intelligences and performance abilities in the open-ended digital learning tasks and in their personal interactions with one another.

3.5.1 Readability statistics of the open-ended digital learning tasks

A computer program called **Flesch-Kincaid Grade Level Scores** was used to check the standard of the materials prepared by the researcher in terms of readability and ease of understanding. A readability statistics was calculated to show if the materials were of the same grade level with the learners. This readability statistics is a computer programme found in the *Microsoft Word programme*.

Readability statistics are mathematical formulae that are designed to assess the suitability of text documents for learners of particular grade levels or learners in defined age groups. The readability formula cannot measure features such as the interest or enjoyment of the reader, how comprehensible a text may be to readers, and whether the text is suitable for the particular needs of specific readers. Readability formulae are usually based on one semantic factor (the difficulty of words) and one syntactic factor (the difficulty of sentences). Words are then either measured against a frequency list or are measured according to their length in characters or syllables, and sentences are measured for their average length in characters or words (http://www.gopdg.com/plainlanguage/readability.html). In this way, the Flesch-Kincaid Reading Grade Level was used to determine the readability level of the tasks. 'Are the learners able to read and understand the tasks with ease?' is a question that the instrument purports to answer. A readability statistic was calculated from all the open-ended digital learning tasks that I had prepared for the study.

The Flesch-Kincaid Reading Grade Level scale measures reading from 100 (easy to read) to 0 (very difficult to read). For most standard documents, the approximate score should be about 60 to 70 for learners in Grades 8 to 10 if one expects that they will be able to read with ease (American standard). The American Grades 8 to 10 are equivalent to Tanzanian grading forms 1 to 3.

After I had applied the Flesch-Kincaid Grade Level Score to the open-ended digital learning tasks that I had prepared, I determined that learners from the grades that would participate could read the text of the tasks with ease. In fact, the learners managed to read and understand the learning tasks with very little help from the researcher (see appendix 3.2 for the open-ended tasks used in the study). Table 3.3

shows the results of the readability statistics for the tasks that were prepared for the study.

Table 3.3: Readability statistics for tasks 1, 2, and 3

Criteria	Task 1	Task 2	Task 3
Passive voice sentences	36%	18%	26%
Flesch Reading ease	54.2	52.2	64.7
Flesch-Kincaid grade level Tanzanian standard -	10.1 (Form 3)	10.1 (Form 3)	8.5 Form 2)

3.5.2 Cohen's kappa statistical measure for inter-rater scores in open-ended digital learning tasks and presentation documents

A holistic type of scoring rubric was used to score all the learners' tasks and presentations that were saved on floppy disks. The researcher and the teachers who participated in the study together did the scoring of the tasks. For fair assessment of the tasks and presentation documents, I used Cohen's kappa statistical measure to calculate the inter-rater reliability coefficient for all the tasks that were marked.

Cohen's kappa reliability coefficient (K) is a measure of percentage agreement corrected by chance agreement. It uses the following equation (Tinsley & Weiss, 2000):

$$K = \frac{P_o - P_c}{1 - P_c}$$

Where:

- P_o = the proportion of the ratings in which the two judges agree.
- P_c = the proportion of ratings for which agreement is expected by chance.
- K = Cohen's kappa reliability coefficient.

The proportion of ratings for which agreement is expected by chance (P_c) was calculated by taking the highest value that a learner could score in the tasks (which was 3), and the perfect agreement among the judges which is 1. P_c is then 1/3 = 0.33, i.e. the proportion of ratings for which agreement is expected by chance in this study.

The maximum possible kappa coefficient is 1. A kappa coefficient of 0.61 represents a reasonably good overall agreement or a significant degree of agreement between the raters. Landis and Koch (1977, p. 165) suggested the following benchmarks, which I also used in this study for interpreting kappa reliability coefficients.

Kappa coefficient	Strength of Agreement
= 0.00	Poor
0.00- 0.20	Slightly poor
0.21- 0.40	Fair
0.41- 0.60	Moderate
0.61- 0.80	Substantial
0.81- 1.00	Almost Perfect

The results of the inter-rater reliability coefficient for all three tasks, and for all the learners, was 'substantially' good to 'almost perfect', with an overall agreement of between 0.74 and 0.82, as is shown in Table 3.4. This means that the learners' performance abilities that were identified in their task documents and presentations, were highly significant and permitted high agreement scores between the researcher and the teachers.

Table 3.4: Cohen kappa reliability coefficient for all three tasks

Open-ended digital learning tasks	Task 1	Task 2	Task 3	Average of all 3 tasks
Kappa coefficient	0.82 (Almost Perfect)	0.74 (Substantial)	0.78 (Substantial)	0.78 (Substantial)

3.5.3 Analysis of the multiple intelligences survey questionnaire

The multiple intelligence survey test instrument provides a measure of all the nine intelligences identified by Gardner (1983; 1996). Each intelligence is represented by ten statements that describe the behavioural patterns of each intelligence. All the learners who participated in the study were given the multiple intelligence survey test instrument and asked to indicate whether or not each statement was characteristic of their behaviour by checking 'yes' (see appendix 3.1). Scores were computed by counting the number of 'yes' responses in each intelligence group. The scores were then categorised into the following three categories: a score of between 8 and 10 items is ***high***, a score of between 5 and 7 is ***medium***, and a score of between 1 and 4 is ***low*** in the categories of logical-mathematical, verbal-linguistic, visual-spatial and interpersonal intelligences. I used this multiple intelligence survey test instrument to identify the primary intelligence profile of all the learners in the sample. The validity of the results depended upon the respondent's willingness, frankness and honesty in

answering the questionnaire. I then validated the results obtained by using other instruments such as the learners' school progress reports.

3.5.4 Analysis of learners school progress report

The school progress reports from the different schools reflected between 10 and 14 subjects. I grouped three different subjects with similar performance abilities together and classified them under the heads of the three main intelligences (logical-mathematical, verbal-linguistic and visual-spatial intelligences). I did not include interpersonal intelligence because its assessment would have required more observed performance abilities than I was able to include in the research design and because I was using written sources for validation. I grouped mathematics, physics and chemistry – subjects that need an ability to use and manipulate numbers to solve mathematical problems and identify numerical relationships – under logical-mathematical intelligence.

For evidence of verbal-linguistic intelligence, I considered learner performance in English, Kiswahili and French language subjects. Verbal-linguistic intelligence is indicated by an ability to use language skills (such as the possession and application of a good vocabulary and sentence structure, an ability to communicate verbally, and, for school-going learners, an ability to express oneself in different but related tasks in science problems, languages and the social sciences. For the visual-spatial intelligence of the learners in the sample, I considered their performances in geography, biology, and computer studies because, in these subjects, learners need performance skills in drawing images and pictures by using charts, maps, diagrams and the ability to use colours.

In order to assess the learner's possible performance ability from the school progress report, I calculated an average score from the three subjects in each intelligence for each individual learner. I then grouped the average scores into the three categories of high, medium and low. Where a learner had an average score of between 70 and 99% I assumed that his or her intelligence was high. For cases where it was between 40 and 69%, I assumed that it was medium, and cases where it was between 10 and 39%, I assumed that it was low. I calculated these scores and values for logical-mathematical intelligence, verbal-linguistic intelligence, and visual-spatial intelligences. The

researcher thus knew beforehand the learner's intelligence profile that had been identified in this way. The teachers who participated as co-observers in the observation sessions were not informed of the learners' profiles. In this way, the teachers who were participating acted as a control to prevent the researcher from influencing the results.

The scoring procedure that I used to assess the learners' tasks and the presentation documents followed the examination scoring criteria that are used in Tanzania by the National Examination Council of Tanzania. The scoring criteria are as indicated below.

81% - 99% - A: (Distinction).
61% - 80% - B: (Above Average)
41% - 60% - C: (Average)
21% - 40% - D: (Below Average)
0% - 20% - F: (Fail)

I selected a participant observer method for us (me and the school teacher) to observe the learners as they worked on their open-ended digital learning tasks and presentation sessions in all four schools. I also personally participated in the study as an observer and helped learners in classroom activities to work through computer troubleshooting and difficulties they encountered in the computer application skills that they had been taught earlier. All the tasks were open-ended and required the learners to make their own personal selections of what they wanted to achieve at the end of the tasks.

3.5.5 The relationship between multiple intelligences and learners' performance using a contingency table

The relationship between multiple intelligences and learners' performance was analyzed descriptively using a contingency table. The descriptive analysis was important to find the relationship between the learners' intelligence profile (strengths and weaknesses) and their performance abilities particularly in computer application skills. I drew up the contingency table by combining the results from the intelligence profile of the learners and the assessment results of the learners' performance abilities in computer application skills in different intelligences. I adjudged a descriptive data analysis procedure to be appropriate because of the small sample size and the purposive sampling of the study unit. These limitations disallow the use of a chi-square statistical test. A chi-square test moreover requires at least 80% of the cells of

a contingency table to contain at least five cases if a satisfactory confidence level is to be obtained from the results (Cohen, Manion, & Morrison, 2000).

In order to describe what the researcher and the teachers had observed and assessed in each activity as vividly as possible, all the results from each open-ended digital learning task and presentation were later reconstructed into ***stories***. Four selected stories were then used to describe four individual learners whose performance strengths were shown to be outstanding in each of the four intelligences selected for this study. These stories indicate performance patterns of learners according to their intelligence profiles and also how they performed across several intelligences as they were engaged in the same open-ended digital learning tasks.

All the activities that had been recorded on videotape and all the interviews that had been recorded on audiocassettes were transcribed. The coding of the data and the identification of themes then followed. The research findings and interpretations are reported in chapter 4.

3.6 Validity and reliability of the study

In the following section, I discuss issues that relate to validity and reliability in the research design. Validity and reliability in a study such as this are important if one wants to produce research that other researchers and observers can describe as credible and trustworthy (Johnson & Christensen, 2000). The other question that needs to be asked is: Is the contribution that this research makes to knowledge in this field both believable and trustworthy? For the purpose of this study, I have used the following terms: ***credibility*** for validity, and ***dependability*** or ***consistency*** for reliability.

3.6.1 Credibility

The study followed several basic strategies to ensure the credibility of the data that was collected. They were triangulation of the collected data, the use of multiple investigators, the checking of research biases, and the use of thick and rich descriptions in the observation process. I used all of these different strategies to obtain the data that I needed for the study (Merriam, 1988; Johnson & Christensen, 2000; Johnson & Turner, 2003).

3.6.1.1 Triangulation of data

Multiple methods of data collection were used to validate the emerging findings. The instruments of data collection were:

1. Structured observation checklists. These were used to check the observed behaviours of the learners as they worked on their open-ended digital learning tasks.
2. Learners' school progress reports and the multiple intelligence survey test instrument were used to identify the learner's intelligence profiles in four intelligences.
3. Semi structured interview schedules for the teachers, parents, and learners were used to solicit more information about the performance assessment process that is the authentic, and open-ended digital learning tasks used, computer application skills and assessment process.
4. Open-ended digital learning tasks and presentation documents were used for document analysis and analyzed with the other data from the rest of the instruments.

Triangulation added credibility to the findings by incorporating multiple sources of data, methods, and investigators (Erlandson, Harris, Skipper, & Allen, 1993).

3.6.1.2 Multiple investigators

A co-observer (a teacher from each school) participated in the study during the observation sessions of the learners while they worked on their open-ended digital learning tasks and while they were making their presentations. All the teachers used the same observation checklist that the researcher did. They used these observation checklists to identify the different performance abilities and patterns of preferences that learners exhibited. Later, after the observation sessions had been concluded, I conducted a reflection session with each researcher. I recorded all the findings that emerged in a journal for future use during the analysis stage.

3.6.1.3 Avoiding research bias

All the four teachers (one from each school) who participated in the observation sessions used the structured observation checklist. The structured observation checklist was handed to the teachers after they had attended a short meeting that I

arranged with each researcher to brief them on and discuss the kinds of observations that we might be expected to make.

A multiple intelligence survey questionnaire was distributed once to the learners immediately when the study started. Only the researcher (not the teachers) knew the results that this questionnaire delivered. Although the researcher was aware of the multiple intelligences results, the teachers acted as a control that prevented the researcher from unduly influencing the observations. After every observation session, each teacher engaged in a brief discussion with the researcher in order to summarise the observations that had been made and in order to assign a common score to the learners. These discussions provided the researcher with a general picture of the trend of performance abilities of the learners and reduced any bias that might have been brought about by the researcher.

Finally, all the open-ended digital learning tasks and presentation documents were scored by the teacher and by the researcher using the same scoring rubric. Then the researcher calculated an inter-rater reliability measure by using Cohen's kappa reliability coefficient (Tinsley & Weiss, 2000) for all the three tasks. The reliability coefficient provided evidence on the agreed score from the researcher and the teacher.

3.6.1.4 Thick and rich description

In this study, I sought to achieve thick and rich descriptions of data by interpreting all the data that I collected from observations, analysis of learners' task documents and presentations, interviews, and school progress reports. The aim of the study was to identify the patterns of performance abilities that the learners exhibited during the study. By using a performance assessment process that utilised observations, interviews, and authentic and open-ended digital learning tasks, thick and rich descriptions of all the data were accomplished.

Thus, for example, some of the important performance activities that were recorded included the interactional processes of the learners as they worked collaboratively. Such activities, for example, included talking to one another, exchanging ideas, having discussions, and working alone or in small groups on the computer. Other activities included scaffolding processes: the way in which learners related to each

other, the ways in which they helped their peers to use the computers, the ways in which they worked, the ways in which they asked for assistance from the researcher and the ways in which they worked on their open-ended learning tasks and their presentations. I used a journal to record all the activities while using an observation checklist as a guide. I obtained rich descriptions moreover from the responses that emanated from the teachers and parents whom I interviewed and from the focus group interviews that I conducted with learners.

3.6.2 Dependability / Consistency

The research investigated the interactions between multiple intelligences and the performances of learners in open-ended digital learning tasks, and it involved young people who were learners from secondary schools in Dar es Salaam and Iringa Regions of Tanzania. These learners worked on prepared open-ended digital learning tasks for a minimum of four hours per day for five days of the week over a maximum period of three weeks for each group.

It was important during the study to interpret as many of the performance abilities and actions of the learners as I could while they worked on the three open-ended task presentations. The teachers and the researcher participated as observant participants during the observation sessions. The degree of consistency with which the performance abilities and actions were assigned to each learner by the researcher and the teachers all using the same category had also to be taken into consideration (Hammersley, 1992). This will now be explained in the following sections.

3.6.2.1 Consistency in observations

1. The researcher and the teachers used a structured observation checklist for recording all the activities performed by the learners as they worked on their open-ended digital learning tasks and presentation sessions.
2. The researcher and the teachers recorded separate notes on the observation checklists if they had other information of interest that they needed to record, were used during the reflection sessions.
3. A camcorder was used to record all the activities on video. This was later transcribed and the transcriptions were later compared to the notes that the

researcher and the teachers had made during the observation sessions (Kirk & Miller, 1986).

4. Reflection sessions were used to discuss all the observed performance activities that were recorded by the researcher and the teachers for a final scoring of the learners. All these discussions were recorded in a journal (Spradley, 1979).

3.6.2.2 Consistency in open-ended digital learning task text documents and presentation documents

1. Structured assessment scoring rubrics were used to assess the open-ended digital learning task documents and the presentation documents that the learners had saved on floppy disks.
2. A teacher from each school and the researcher used the same scoring rubrics to assess the learners' open-ended digital learning tasks and presentation documents. This was done so that an inter-rater reliability could be obtained (Silverman, 2001) and so that the level of consistency of learners' performance abilities in all three tasks could be determined because reliability depended on replication and on the aggregation of multiple observations (Reizen & Kaser, 1989).

3.6.2.3 Consistency in interviews

1. Semi-structured interview schedules were used to collect information from the parents, teachers and learners in focus groups. The interviews permitted the researcher to probe for in-depth information from parents, teachers and learners, and also allowed for the asking of questions of clarification in cases where the interview question had not been understood.
2. The tape recording of all interviews was made on an audiocassette recorder.
3. All these audiocassettes were then transcribed in terms of the answers given.

This process was necessary to obtain reliable information. Working on human behaviour and investigating the performance abilities of learners is not easy because behaviour is never static and if one does not obtain the right information at once, the opportunity passes (Merriam, 1998).

3.6.3 Validity and reliability of scoring rubrics

In the development of scoring rubrics, reliability was important and had to be taken into consideration. This means that a good scoring rubric is likely to improve both inter-rater and intra-rater reliability. A scoring rubric with well-defined scoring categories can assist in maintaining consistent scores regardless of who the rater is or when the rating is completed.

Inter-rater and intra-rater reliability are two forms of reliability that are typically considered in classroom assessment. Rater (scorer) reliability generally refers to the consistency of scores that two independent raters assign and the consistency of scores that the same rater assigns at different points in time (Moskal & Leydens, 2000). The former is referred to as 'inter-rater reliability' while the latter is referred to as 'intra-rater reliability'.

Inter-rater reliability refers to the concern that learners' scores may vary from rater to rater. Learners are often critical of examination results that seem to show that their scores appear to be based on the subjective judgment of an instructor. Thus, for example, an examiner may reach a conclusion about a learner's written products after merely reading it and then making a judgment about its quality. If there are no predetermined and established criteria that can be used to guide a rating process, two independent raters may end up assigning different scores to the same response. Each rater has his or her own evaluation criteria and these are bound to differ from those of others. Scoring rubrics take this concern into account by formalising criteria at each score level (Moskal & Leydens, 2000). Such descriptions of score levels are used to guide the evaluation process. Although scoring rubrics do not completely eliminate variations among raters, a well-designed scoring rubric can reduce the incidence of such unacceptable discrepancies.

Factors that are external to the purpose of the assessment can also impact the manner in which a given rater scores student responses. Thus, for example, a rater may become fatigued with the scoring process and begin to devote less and less attention to a particular analysis over a period of time. Thus certain responses may be given different scores from those that they might receive if they had been scored earlier in the evaluation period (Moskal & Leydens, 2000). If a rater's mood on the given day is

less than optimal or if a rater knows who a respondent is, he or she may allocate scores that are different from what they might have been if conditions had been better or fairer. All these factors affect the scoring process. A correct response from a failing student may be more critically analysed than an identical response from a student who has been performing well (Moskal & Leydens, 2000).

According to Moskal and Leydens (2000), intra-rater reliability refers to each of these situations in which the scoring process of a given rater changes over time. The inconsistencies in the scoring process result from influences that are specific to the rater rather than from true differences in student performances. Well-designed scoring rubrics respond to the concern of intra-rater reliability by establishing a description of the scoring criteria in advance. Throughout the scoring process, the rater should revisit the established criteria in order to ensure that consistency is maintained.

The most recent opinions of proponents of performance or alternative assessment and of the theory of multiple intelligences give great importance to social context in which learning tasks take place and the relation between ability and responses to various forms of cooperative and guided learning. Teachers and learners usually work collaboratively because a school and classroom do not exist in a social vacuum.

3.6.4 Transferability / Generalizability

The research study was limited to a small sample of four schools: 40 learners, four teachers and ten parents. I selected this sample purposively because I wanted to achieve an in-depth understanding of the interactions between multiple intelligences and the performance abilities of learners who performed on open-ended digital learning tasks. The inability to generalise is compensated for by the opportunity I had to study a small sample of the learners in a performance assessment process based on the theory of multiple intelligences. The results may however be compared to studies performed on learners with the same computer skills, educational backgrounds and similar cultures in the same kind of context. Borman, LeCompte, and Goetz (1986) also affirm that such findings can only be generalizable to the extent that they can be compared to similar research sites, events or populations.

3.7 Ethical Issues

Ethical issues have to be taken into account in any data collection process. Important ethical issues in this study included the confidentiality of all the participants, the informed consent of the parents/guardians of the learners who participated in the study, and a proper relationship among the researcher, the learners, the teachers, the parents, and the school administration. Participation of learners in the study was voluntary and nobody was forced to participate. The identity of the schools and individuals who participated in the study have been protected because they were all allocated letters that indicated that their schools and learners will function as pseudonyms in the reporting phase of the study (Gall et al., 1996). Ethical issues pertinent to data collection, data analysis and interpretation, the writing up and the dissemination of research results are all dealt with in the following sections.

3.7.1 Ethical issues in data collection

3.7.1.1 Gaining access

I used a research clearance letter from the University of Dar es Salaam in order to obtain permission to conduct my research in the sample schools from the Regional Education Offices for Ilala, the Temeke districts in Dar es Salaam Region, and the Iringa Region. I then applied by letter to the head of each school asking for permission to conduct this research in their schools. This research clearance letter attested to my identity and bona fides as a researcher and employee of the University of Dar es Salaam and a student from University of Pretoria. It also explained the objectives of the research, the time frame of the study, how the confidentiality of the data and the personal identities of participants would be maintained, and a description of how the data would later be used for research purposes only. For a copy of the letter is contained in appendix 3.10

3.7.1.2 Participants' participation

I observed that the right to participate in this study has to be highly appreciated by participants and I took this into consideration. Because the learners who were involved in the study were all legal minors (aged between 16 and 19 years), a letter of consent was given to the learners to ask them permission if they could participate in the study. A sample of the letter can be seen in appendix 3.11. Moreover, a letter was sent to the parents of the learners to ask them permission if they could allow their

child to participate in the study voluntarily, and the letters had to be signed by the respective parent or guardian. This letter also included information about the purpose of the study, procedures that I would employ, and acknowledgement of participant's participation in the study. In the letter, I moreover assured the parents about the security of the learners and explained that identities would be protected during the data collection and analysis process. For a sample of the consent letter that I sent to the school administration and parents, see appendix 3.12.

3.7.1.3 Interview process

I used a semi-structured interview protocol in the study. I recorded all the interviews with learners, teachers and parents on a Dictaphone. I asked for and obtained permission from all the respondents who would be recorded before any recording session commenced.

3.7.1.4 Questionnaires

I used a structured questionnaire schedule in this study. The multiple intelligence survey questionnaire was administered to all learners at the beginning of the study. I used the multiple intelligence survey questionnaire to identify the intelligence profile of each learner. I also administered a questionnaire to all the learners, teachers, and parents who participated in the study in order to obtain their demographic data. All the questions in this demographic data questionnaire were structured so that I would obtain the information that I needed to complete demographic profiles of participants in the study. I used plain English so that I would be sure that no one would be embarrassed by not understanding what was contained in this questionnaire.

3.7.2 Ethical issues in data analysis and interpretation

3.7.2.1 Analysis of data

Since the researcher is the primary instrument for collecting and controlling data in this study, it is conceivable that some of the data might have filtered through her particular theoretical position and biases – positions and biases that might not have been readily apparent to the researcher herself (Merriam, 2002). During the analysis phase, I checked my interpretation of data and accuracy by using different data sources wherever possible. Another factor that militated against bias was my use of anonymity for the individuals who participated in the study. Because I used

pseudonyms for all individual learners, teachers and schools during the writing process, any bias that I might have entertained about individual places and individual identities are likely to have been minimised or even avoided altogether.

I implemented the ethical guidelines and principle that have long been established by the Government of Tanzania, The University of Dar es Salaam, the Ministry of Education and Culture of Tanzania, and University of Pretoria throughout the study. Thus, for example, the research clearance that I received from the University of Dar es Salaam established the researcher ownership of the research data and furthermore specified that the data would be used only for study and research purposes. The data itself remains legally the property and possession of the University of Dar es Salaam. The University retains the right as the legal institutional owner to withdraw the data if it is abused in any way or shared in an improper way with individuals who are not involved in a bona fide way in relevant study or research.

3.7.3 Ethical issues in writing and disseminating research findings

3.7.3.1 Dissemination of findings

I have used plain and straightforward English language throughout in reporting of the findings from the study, without, I believe, compromising the complexity of certain issues and procedures. I have been especially careful in the writing process not to use language or words that might be construed as biased against the learners, teachers and parents who were involved in the study. The research report includes the real and actual findings from my study. Creswell (2003) notes that fraudulent practices and data are totally unacceptable in professional research communities. Finally, I will make my written interpretations and reports available to the heads of the school on behalf of the learners, parents and teachers as a token of thanks for their participation and contributions to the study. Also each learner who participated in the study up to the end of the data collection process received a certificate of attendance (see appendix 3.13).

The findings of the study will be reported in chapter 4, the next chapter.