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3. CHAPTER 3 RESEARCH DESIGN AND METHODOLOGY

3.1. Introduction

The research problem is designed to obtain information about how high school children react to the various elements of an eLearning environment. Both the resource and the eLearning community need to be analysed before they will yield information about the kind of elements in an eLearning resource that will best support a learning community of high school learners.

An intellectual research puzzle, proposed by Mason (Mason, 2002), will be set out specifically for this research in the form of a main research question, subsidiary questions and objectives. In addition, a research strategy and research design to address the research questions will be proposed.

The methods applied include observation, analysis of written texts, various questionnaires, focus group interviews with an external interviewer, interviews by the researcher, and telephone interviews. The data gathered in the resource repository has also been analysed.

For every method used, the related collection instrument with its concomitant objectives, advantages and disadvantages are explained. Corrective measures to counterbalance the disadvantages are described. Member checks, peer reviews, crystallization, and investigator triangulation have been used to ascertain levels of trustworthiness and authenticity in the study.

3.2. Research problem and motivation for the study

As I mentioned in chapter 1, the purpose of this research is discover "to what extent and why are certain features of a high school eLearning resource workable and desirable for sustaining a high school learning community"?

Given such a purpose, the objectives of the research are:

1. to investigate how and why pedagogical and eLearning theories and issues influence an eLearning resource

2. to analyse how and why certain features of a learning community inform an eLearning resource

3. to evaluate how and why communication, collaboration and social issues inform an eLearning resource

4. to determine the way in which various technological and instructional design issues affect an eLearning resource and to suggest why they affect eLearning

3.3. Research questions

From the objectives, the following research questions emerge:

1. To what extent do certain pedagogical theories and eLearning theories inform a high school eLearning resource?

2. Why do certain community elements in an eLearning resource contribute to creating and sustaining high school learning?

3. In what way and why do certain communication, collaboration and social elements influence a high school eLearning resource?

4. How do certain technological aspects and instructional design issues affect a high school e-learning resource?

The main research question and the essence of the enquiry (Mason, 2002) can be summarised as follows:

> *To what extent and why are certain features of an eLearning resource workable and desirable for sustaining a high school learning community?*

According to Mason (Mason, 2002), the main research question and the essence of the enquiry can be summarized in the form of an intellectual research puzzle. This is represented below in tabulated form. The research question is posed and the research objectives and subsidiary questions are linked.

The intellectual puzzle for this study (summarised)		
To what extent and why are certain features of a high school eLearning resource workable and desirable for sustaining a high school learning community?		
Research Question	**Research Objectives**	**Subsidiary Questions**
To what extent and why are certain features of an eLearning resource workable and desirable for sustaining a high school learning community?	Find out to what extent the eLearning resource allowed students to engage in learning.	Question 1 To what extent do certain pedagogical theories and eLearning theories inform a high school eLearning resource? -Cognitive Theories – Hexa-C plus -Multiple intelligences -eLearning theories and models
	Find out to what extent the eLearning resource facilitated the creation and maintenance of an eLearning community	Question 2 Why do certain community elements in an eLearning resource contribute to creating and sustaining high school learning -Personality -Gender -Learning and thinking styles -e-community specifi elements
	Find out to what extent the eLearning resource enabled students to communicative and collaborate	Question 3 In what way and why can certain communication, collaboration and social elements inform a high school eLearning resource? -Communication –discussions -Collaborative learning
	Find out what technological contraints and opportunities were imposed by the resource	Question 4 How and why do technological aspects and instructional design issues impact on

	on the students and vice versa	a high school eLearning resource? -What are the features of eLearning resources and what are their influences -How was the resource (Moodle) used during the year.

Table 16 : The intellectual puzzle applicable to this study in terms of the schema set out by Mason (2002)

3.4. Research paradigm.

Merriam (Merriam, 1998) asserts that it is helpful to position research in terms of the philosophical tradition in which the research is framed. The philosophical basis of research will elucidate the way in which one thinks about the development of knowledge (Saunders, 2000) and about the production of knowledge (Merriam, 1998).

Cohen (Cohen, 2002) points out that the three dominant approaches or paradigms in the study of behaviour are normative (positivist) research, interpretive research and critical research. While normative (positivist) research attempts to explain behaviour by reference to its causative factors, interpretive research attempts to understand actions and meanings rather than causes. Critical research, by contrast, tends to focus on themes of interrogation, critique and the transformation of actions and interests. While interpretive research tends to be explanatory in a non-statistical way, normative or positivist research models itself on the kind of research that has predominated in the natural sciences since the Enlightenment. Critical research tends to engage in ideological critique and action research and often displays an emancipatory bias. Normative research is more technical. Interpretive research has a practical interest. Interpretive research draws its conclusions from engagement with actual dynamic conditions and situations.

In interpretive research, the researcher is personally involved (as is the case with this research), and research is conducted from the "inside" and not "from the outside" – as it is in normative research (Cohen, 2002). In interpretive research, the researcher seeks to discern the meaning of actions as they are expressed in a specific social context (Carr, 1986).

Positioning this research in Burrel and Morgan's research paradigm

Burrel and Morgan (Burrel, 1979) offer forward a diagram to position research in terms of epistemological range and ontological dimensions.
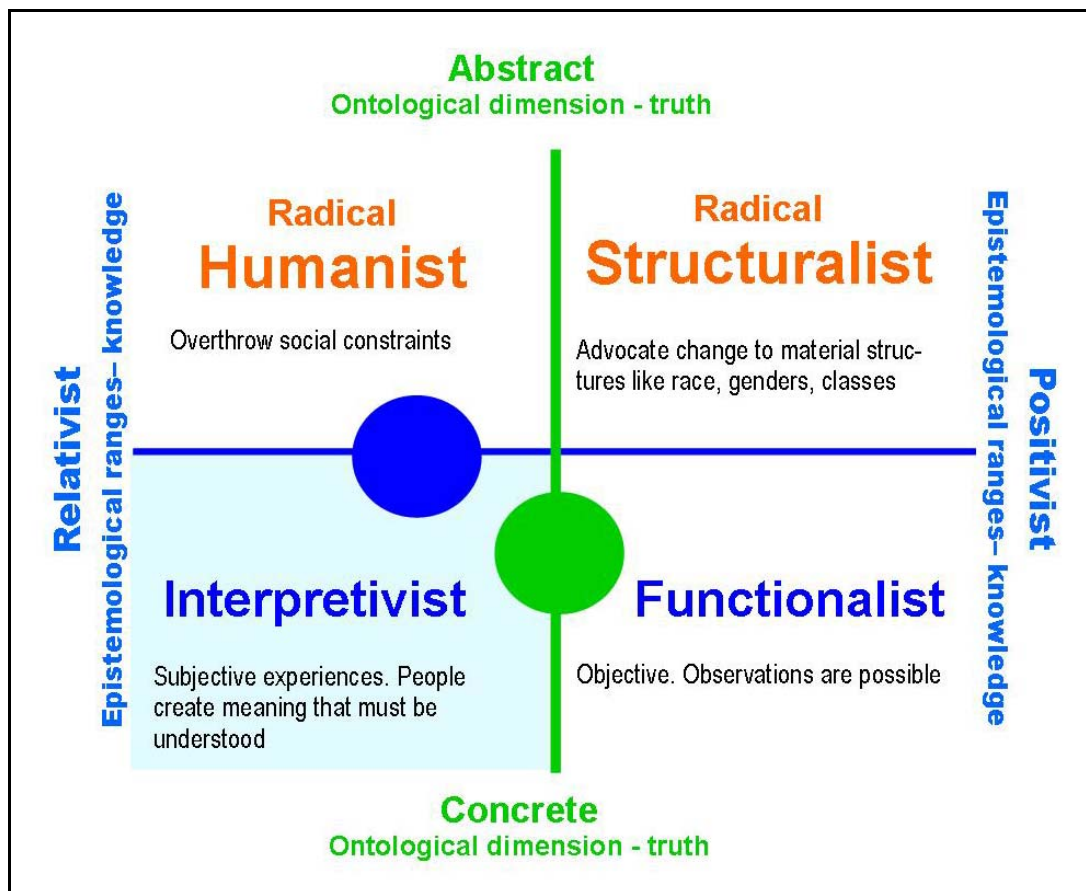

Table 17 : Research paradigm
(Burrel, 1979)

The diagram above shows how the present research fits into the interpretivist quadrant.

This research falls into the Interpretivist quadrant.

The interpretivist paradigm (represented in the bottom-left quadrant) maintains that social scientists are concerned with understanding the social construction of reality or the ways in which people create and share meaning. According to Burrel and Morgan (Burrel, 1979), the interpretivist paradigm is informed by a concern to understand the world as it is at the level of subjective human experience. The interpretivist researcher attempts to understand and analyse this reality.

Although this present research falls into the interpretivist-interactionist quadrant, it also shows characteristics of the functionalist quadrant because it analyses data in a quantitative manner as a prelude to making suggestions about how eLearning for the learners under consideration could be improved. This extended case study can also be considered a formative evaluation of an eLearning system as well as a developmental research approach for increased usability, since the aim was to study how the resource sustains a learning community and interpret resulting phenomena, as well as to offer suggestions about how the resource might be improved. A more detailed description of the positioning of this research in terms of Burrel's paradigm is included in APPENDIX 3.

3.5. Research approach.

The research approach in this study is qualitative with some accompanying quantitative elements. My aim in doing this research was to study events in their natural setting and to interpret whatever phenomena arose out of these events in terms of the meaning attributions of the people (the learners) who were the

subjects of this study. According to Husen (Husen, 1999), such an approach is widely used in the humanities. It characteristically emphasises efforts to understand (verstehen) the whole (holistic) picture. This approach is well suited to this study because it incorporates both these elements. I investigated how a defined group of learners used a particular eLearning resource in its natural setting. This investigation was the prelude to an attempt to understand and interpret how the resource sustains a learning community.

The qualitative approach is also suited to this research because it focuses on the subjective experiences and opinions of individuals and is sensitive to and interested in the contexts in which people interact with each other (Mouton, 2001).

The quantitative research contained in this research serves to triangulate (crystallize) and corroborate the findings in qualitative interpretations.

The nature of qualitative study

"Qualitative" implies an emphasis on the quality of the entities that are being scrutinized rather than on conclusions drawn from the kind of numerical and statistical data that is generated in experiments in the hard empirical sciences (Denzin, 2000). Qualitative researchers look for meaning in the socially constructed nature of reality as it exists, in the relationship between the researcher and what is being studied, as well as in the situational constraints that shape the research (Denzin, 2000).

Nelson defines qualitative research as interdisciplinary, transdisciplinary, and sometimes counterdisciplinary (Nelson, 1992), in (Denzin, 2000). Qualitative research incorporates the humanities, the social sciences and the physical sciences simultaneously. It is the source of many different points of view,

attitudes and assumptions. It makes use of multiple paradigms and its practitioners will use as many methods as they need to produce meaningful results. Qualitative researchers are committed to the naturalistic point of view and to an interpretive understanding of human experience. Qualitative research exists in a creative tension between two apparently opposed worldviews. On the one hand, "it is drawn to a broad, interpretive, post-experimental, postmodern, feminist, and critical sensibility. On the other hand, it is drawn to more narrowly defined positivist, postpositivist, humanistic, and naturalistic conceptions of human experience and its analysis."

Savenye and Robinson (Savenye, 1996), in (Adendorff, 2004), define qualitative research as research devoted to developing an understanding of human systems which typically includes ethnographies, case studies and generally descriptive studies. This research is based on an extended case study.

Merriam (Merriam, 1998) and Cresswell (Creswell, 1998) define qualitative research in terms of its characteristic. These are summarised in the table below.

Characteristics of qualitative research			
Characteristics	Creswell (1998)	Merriam (1998)	In this study this occurs as….
Natural settng as source of data	yes	yes	The online environment as it is used in a natural (i.e. actual educational) situation
Researcher as key instrument of data collection	yes	-	– The researcher observes. – The researcher selects, analyses and synthesizes texts. – The researcher conducts interviews.
Data collected as words or pictures	yes	yes	Data collected through the various text formats
Outcome as process rather than product	yes	yes	The online activities are a reflection of a process rather than a product.
Inductive analysis that	yes	yes	General principles

pays attention to particulars.			(conclusions) are derived from particular facts and instances (see below for more on the inductive approach)
Focus on participants' perspectives and personal meanings	yes	yes	Personal meanings are deduced from questionnaires, focus groups and interviews.

Table 18 : Characteristics of qualitative research
The table above clarifies the characteristics of the kind of qualitative research that is used in this study.

The inductive approach (Bradford University, 2004, Saunders, 2000) used in this research is evident from the researcher's method. The researcher gathered ideas, opinions and data which he then collated, classified, processed, analysed and presented in the form of conclusions or findings. These conclusions are not imbued with the same status that they would have had the research been quantitative, and they in no way compromise the *sui generis* nature of the original ideas and opinions of the participants.

Qualitative research is qualitative if it complies with the following criteria:

- It is primarily concerned with identifying and understanding the unique meanings that participants attach to events and to their experience of such events.
- It strives to understand and to incorporate the research context into the research process.
- It strives to amass a collection of qualitative data that is richly textured and layered.
- It never loses sight of the fact that the researcher is part of the research process.
- It is not overly concerned to generalise results.

Cresswell (Creswell, 1998) explains that qualitative research is preferred in a study of this kind for the following reasons:

- The research question usually starts with *how* or *what* questions.
- The topic needs to be extensively explored and it contains a number of variables about which knowledge needs to be obtained.
- The researcher is actively involved as an active learner in the process.

3.6. Research strategy.

A research strategy is a general plan of the research. More specifically, it describes the means that the researcher will employ to go about answering the main research question and the subquestions. It sets out the complete research plan (Cohen, 2002).

The case study is the primary strategy for effecting the research. Miles and Huberman (Miles, 1994) describe a case study as a phenomenon that occurs in a "bounded context" (Merriam, 1998).

This research also complies with Stake (Stake, 1995) and Cresswell's (Creswell, 1998) assertion that a case study must have observable boundaries. Merriam (Merriam, 1998) proposes two questions that should be asked to confirm the limits of data collection:

1. Is there a limit to the number of people involved who could be interviewed?
2. Has a finite amount of time been allocated to observations?

The current research fits this pattern as both these questions can be answered in the affirmative. The case study involved around 200 learners and the data was drawn from observations that took place over a period of two academic years. The research began at a particular time and ended at a particular time. The

subject of the study (the learners and the researcher) constituted a specifically defined group bounded in time and space and by circumstances.

According to Merriam (Merriam, 1998), Shaw (Shaw, 1978) and Creswell (Creswell, 1998), in (Adendorff, 2004), a case study contains special features that are particularistic, descriptive and heuristic. The following table provides a summary of these features.

Special features of a case study	
Features described by Merriam, Shaw and Creswell (quoted in Adendorff)	Features operational in this study
Particularistic A case study focuses on a **specific event** or situation. It may be able to suggest what to do or not to do in a similar situation, or it may examine a specific instance that highlights a general problem.	This study focuses on a specific eLearning environment. Data from the study may throw light on the kind of general problems that are being experienced in other similar situations where high school learners use a comparable learning resource..
Descriptive Case studies produce **rich and thick descriptions** of the phenomenon being studied. These include numerous variables that are indicative of the interactions that took place in a specific time period. Case studies also expose to scrutiny the complexities inherent in any particular situation, the influence of personalities, differences of opinions, and the influence of timelines such as deadlines. Case studies also the source of the quotations that are extracted from interviews, other kinds of data, and the way in which information is presented.	The study produces rich and thick descriptions of the eLearning environment experiences of the learner. It generates a multiplicity of variables and reveals the extent of the interactions that took place during the period of the study. It vividly mediates the complexities inherent in the situation. It reveals the influence of teachers, administrative staff, parents and learners, and shows how opinions differed among these groups. Deadlines were operational throughout the study and the effect of this can clearly be seen. The data includes interviews and quotations from those concerned, as well as data from many other sources such as server logs and eLearning resource logs.
Features described by Merriam, Shaw and Creswell (quoted in Adendorff)	Features operational in this study
Heuristic A case study helps the researcher to **understand** what is being studied. It brings new meanings to fore. It extends experience and	The researcher has attempted to provide the reader with a clear understanding of the high school-level eLearning that took place in the

confirms or disproves what is already known. It may explain the reasons for a problem and locate what has happened in the context of background information. Its evaluations and summaries may extend the usability of the case.	particular circumstances of the study. Numerous issues and situations were analysed. Possible improvements were pondered and evaluated before suggestions for improvements were made. The summary in the last chapter shows the increased usability that is one of the results of this study.

Table 19 : Special features of a case study
(Creswell, 1998, Merriam, 1998, Shaw, 1978) in (Adendorff, 2004)

This research is an explanatory case study.

The explanatory case study type fits this research. Yin (Yin, 2003) elaborates on three different types of case studies, exploratory, descriptive and explanatory. Exploratory case study is aimed at defining the questions and hypotheses of a subsequent study, or at determining the feasibility of the desired research procedures. A descriptive case study presents a complete description of a phenomenon within its context. An explanatory case study presents data bearing on cause-effect relationship, explaining how events happened.. This research is not ethnography, phenomenology, biography or grounded theoretical study (more detail provided in APPENDIX 4.

3.7. Research design.

3.7.1. A summary of the research design for this study is presented below.

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Research design	eLearning course for high school learners during 2004 and 2005					
Data collection methods	Observation	Content and data analysis	Interview Focus groups with learners	Interview Focus groups with teachers	Interview Individual interviews with learners	Interview Individual interview with teachers
Data collection instruments	Researcher notes	1. Asyn- chronous Moodle electronic messages in discussion forums. 2. Formal tests / assignment responses 3. Formal test responses 4. Self-administered questionnaires	Recorded and transcribed	Recorded and transcribed	Recorded and transcribed	Recorded and transcribed
Data source	Researcher notes and reflection	Server logs, eLearning resource logfiles, test results, questionnairre data results,	Recording and transcribed text	Recording and transcribed text	Recording and transcribed text	Recording and transcribed text
When administered	2000-2006	Jan-Dec 2004 and 2005	Oct 2004 & March 2006	Oct 2004	May 2006	Oct 2004
Person or people who conducted the procedure	Researcher	-Researcher. -Specialists	Group 1: External specialist as discussion leader Group2 : researcher	Group 1 External specialist as discussion leader Group 2 : by researcher	Researcher	Researcher
Verification: Trustworthiness and authenticity	Member checks	Member checks Crytalization (triangulation) Results from various data sources used Correlation:2004 & 2005	External specialist as discussion leader Member checks Crystalization Correlation:2004 & 2005	External discussion leader Crystalization	Member checks Crystalization	Member checks Crystalization
Ethical cosiderations	Covert observation	Consent obtained Restrict information to case study only	Consent obtained Restrict information to case study only	Restrict information to case study only	Restrict information to case study only	Restrict information to case study only

Table 20 : Research design for this study

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3.7.2. Research design - the case study of this research.

The case study, as has been noted, is an explanatory instrumental case study (Stake, 2000) or a particular case that provides insight into an issue. In this case, the case study was based on the actual learning resource of participating high school pupils who were officially enrolled in 2004 and 2005 at the college for the eLearning courses that would lead to an officially recognised qualification. More details about the specifics of the case study as well as the setup of the case study are set out in the paragraphs below.

3.7.2.1. The case study group and background.

The learners in this study group were enrolled in 2004 and 2005 with a distance education institution for high school learners called Brainline (Brainline, 2006) in Pretoria, South Africa, with the view of obtaining an external Cambridge IGCSE qualification (Cambridge International Examinations, 2006).

This group of learners was the first group to participate in and use the eLearning resource to further their studies for this secondary-level qualification. Although this resource is similar to a university-style eLearning resource, it is obviously pitched at a level that is suited to the needs of secondary school learners. This research provides a view of the kind of strategy that was implemented during the first and second year of implementation.

Approximately 200 learners enrolled for the courses that are relevant to this research. The learners enrolled for the course came from four different age groups and ranged in age from between 13 and 18 years old.

For some of these learners, it was their first year in a system of this kind. Others had been in the system for between three and four years.

The average amount of time spent by learners in the sample in a distance education environment was two years (see picture of questionnaire result in this regard).

3.7.2.2.   The eLearning program used.

The eLearning resource used in the college is more or less representative of what is usually found in eLearning resources of this kind. The open-source system Moodle (Dougiamas, 2000) was used and adapted for the resource.

The resource has many different features and includes elements that address the usual needs of distance education learners. Such elements include online lessons, forums, quick and trouble-free access to marked assignments, assignment memorandums and examinations. The resource also includes other features such as the template for an online personal journal, a chat room and an online events calendar. The calendar keeps learners informed about important dates such as assignment deadlines, examination deadlines, the scheduling of quizzes, communication times between the learners and subject advisers, and group projects created by subject advisers.

3.7.2.3.   The process.

The aim of the course is to do everything possible to help enrolled learners to pass the demanding Cambridge examinations at the end of two, three or four

years of study. In order to achieve this, several measures were put into place that provide pace and purpose in the study schedule. Four assignments that mimic the kind of final examinations that learners can expect to see are required to be completed by each learner, together with satisfactory attendance at face-to-face workshops four times each year.

3.7.2.4. The samples

Several sampling strategies were used. What these strategies were depended on was the data collection tool that was used. They ranged from "typical" samples that reflected the average learner and situation in this case (Adendorff, 2004, Burns, 1997). These were used to select candidates for interviews. Then there was the kind of strategy in which no samples were drawn and questionnaires were sent to all learners.

The sample selection was in no way atypical, extreme, deviant or intensely unusual (Merriam, 1998). The participants or learners selected themselves by enrolling without coercion or compulsion for the courses (and with their parents' consent). The participants in the study were selected because they happened to have enrolled for the course. Learners who have English as a first language make up approximately 50% of the group. The balance use English either as a second or a third language in a country (South Africa) in which there are thirteen official languages.

3.8. Research methodology and data collection.

3.8.1. Research method.

Once the research objectives have been clarified, certain research methods are

then selected. Reeves (Reeves, 2000) presents six major types of research methods that are used by educational technologists namely quantitative methods, qualitative methods, critical theory methods, historical methods, literature review methods, and mixed research methods. This research follows a mixed research method approach by combining quantitative and qualitative methods. It includes a literature review that explores, analyses and synthesizes the field of eLearning theories. It also includes case study evaluations that combine qualitative and quantitative research (which is why it may be classified as a mixed research method).

3.8.2. Data collection methods

An analysis of data obtained from the web server on which the eLearning course was run was done. Questionnaires with research questions that were designed to elicit both quantitative data and qualitative information were used. An interview protocol with open-ended questions was drawn up and the interviews were recorded before being transcribed.

Data collection instruments

Data collection instruments			Authenticity and trustworthiness	
Observe	**Select / Analyse data texts**	**Interview**	**Member checks and peer reviews**	**Crystalization**
1. Researcher interview; the researcher's notes; the diary of the researcher	2. Literature study 3. Asyn-chronous Moodle electronic messages in discussion	7. Focus group interview with learners 8. Focus group interview with learners by an external interviewer with	Verification with students, facilitators and administration staff that the data was correctly interpreted.	The telling of the same story by means of data gathered from different data collection instruments.

as a participant observer; observations about students' learning	forums. 4. Formal tests / assignment responses 5. Formal test responses 6. Self-administered questionnaires	the researcher as an observer. 9. Personal semi-structured telephone interviews with students 10. Focus group interviews with facilitators and administration personnel. 11.Focus group interview with technical staff..		

Sub-questions	Observe	Texts	Interview Focus groups
To what extent and why do certain pedagogical theories and eLearning theories inform a high school eLearning resource?	1	2,3,4, 5,6	7,8,9,10,11
Why do certain community elements in an eLearning resource contribute to creating and sustaining high school learning?	1	2,3,4, 5,6	7,8,9,10,11
In what way and why do certain communication, collaboration and social elements influence a high school eLearning resource?	1	2,3,4, 5,6	7,8,9,10,11
How and why do certain technological aspects and instructional design issues affect a high school eLearning resource?	1	2,3,4, 5,6	7,8,9,10,11

Table 21 : Data collection instruments
The tables above show data collection instruments and authenticity and trustworthiness indicators. The data collection methods were suited to the envisaged research objectives.

3.8.3. Matrix of research questions and methods - The Intellectual Puzzle.

A data collection matrix below tabulates the methods and instruments used to answer the research questions. The data collected contributed to answering the

research questions.

| The intellectual puzzle for this study (summarised)		
To what extent and why are certain features of an eLearning resource workable and desirable for sustaining a high school learning community?		
Research Question	Research Objectives	Subsidiary Questions
To what extent and why are certain features of an eLearning resource workable and desirable for sustaining a high school learning community?	Find out to what extent the eLearning resource allowed students to engage in learning.	**Question 1** To what extent do certain pedagogical theories and eLearning theories inform a high school eLearning resource? What are the pedagogical and eLearning theories and issues that inform an eLearning strategy that sustains a learning community for high school learners? – Cognitive theories – Hexa-C plus – Multiple intelligences – eLearning theories and models
	Find out to what extent the eLearning resource facilitated the creation and maintenance of an eLearning community	**Question 2** Why do certain community elements in an eLearning resource contribute to creating and sustaining high school learning? -Personality -Gender -Learning and thinking styles -e-community specifi elements
	Find out to what extent the eLearning resource enabled students to communicative and collaborate	**Question 3** In what way and why do certain communication, collaboration and social elements influence a high school eLearning resource? -Communication –discussions -Collaborative learning -Social- and community of learning issues
	Find out what technological contraints and opportunities were imposed by the resource on the students and vice versa	**Question 4** How do certain technological aspects and instructional design issues affect a high school e-learning resource? -What are the features of eLearning interfaces and what are their influences -How was the resource (Moodle) used during the year.

Table 22 : Summarized Intellectual Puzzle for this research / The Research Matrix

3.8.4. Observation.

Observation can provide additional information about a research topic. This technique was not used extensively in this study.

A brief overview of the epistemological and ontological positions on the use of observation follows here. The ontological position (Mason, 2002) assigns a central place to interaction, action and behaviour. People make meaning and sense of their world by means of their conversations with others in their daily routines.

The figure below illustrates the different ontological views on observation in a pictorial format (Saunders, 2000). The researcher's role in this study is indicated by the shaded circle. It indicates the researcher in the role of observer.
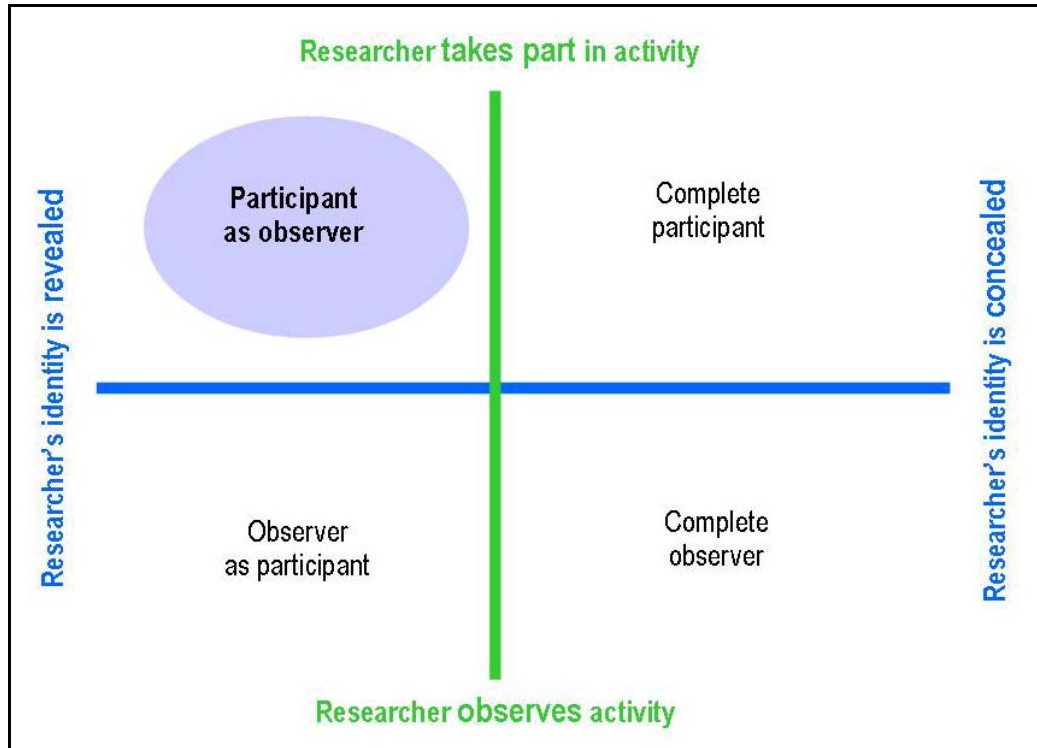
Table 23 : Typology of participant observation researcher roles
(Saunders, 2000)

The role of the researcher may be determined from answering the questions asked by Saunders (Saunders, 2000). The first question asks whether the researcher(s) takes part in the activity or not. In those cases where researchers take part in the activity itself, their role should be indicated in the top quadrants. The next question asks whether the researcher's identity is revealed or concealed. This clarifies the researcher's role in the research. If indeed the researcher plays an open part as an observer in the research, this should be indicated in the top-left quadrant. The researcher then is defined as a participant and observer. In the present study, the researcher took an active part in the activity because he was a subject adviser, an administrator and the creator of the system. Because of the extent of the researcher's involvement and the possibility of bias that this engenders, the role that researcher observation plays in the analysis and evaluation of data has been minimised in this study.

3.8.5. Electronic messages.

Textual communications in the form of documents, or pieces of text in a written (typed) format, were the most important means of communication in the eLearning resource. The eLearning resource makes use of discussion forums and chatrooms. These were analysed.

Assignments and feedback on assignments make up a significant element in the resource but are of a purely subject academic nature. These were analysed indirectly through questionnaire questions.

This study uses a substantial number of written (typed) text. The texts are used in triangulation (crystallization) to corroborate the evidence from other data sources. They are important in their own right as they act as a form of expression and communication (Mason, 2002). Mason states that it is important to read, analyse and interpret the texts in the context of how and why they were produced and used and what meaning they have for the participants. The texts must be analysed in the light of what they are seen to be and what they represent in the natural setting.

In the Table below the list of documents or written (typed) texts is indicated.

Selection of texts that were analysed for data	
1. Literature review	Paper-Electronic

2. Self-administered questionnaires
    5.1 Questionnaire 1 – Students
    5.2 Questionnaire 2 – Students
    5.3 Questionnaire 3 – Teachers
	Paper-Electronic

3. Computer generated log fils	Electronic
4. Asynchronous Moodle electronic messages in discussion forums.	Electronic
5. Formal test responses	Paper-Electronic
6. Focus groups interviews	Paper-Electronic

Table 24 : Written (typed) text used in this research
The table lists the types of written (typed) text used in this research

Advantages and distadvantages of textual documentation.

According to (Saunders, 2000), the advantages of using textual documentation may be summed up by the following three assertions:

- Textual documentation introduces few biases into information.
- Comprehensive information can be obtained from textual documentation.
- Gathering the data from textual documentation does not interfere with the program.

McNamara (McNamara, 2004b) summarises the disadvantages of using documentation for data collection, together with counter measures that can be used to offset the disadvantages. These are set out below. They are all relevant and applicable to this study.

Disadvantages	Countering measures in this research
Data from documentation may take a long time to gather and organise.	The data from documentation in this study was gathered over a period of two and a half years. Electronic data-gathering techniques made is possible to obtain the information quickly.
Data from documentation may be incomplete.	The documentation from which the data was gathered was not incomplete because it consisted of scheduled submitted work that had been submitted and regular postings. Data was gathered right up to the end of two academic years. This therefore presented a complete picture of events in this area.
Data from documentation restricts one to what already exists.	The eLearning system is not closed down at the end of the academic year. The researcher was therefore able to rerun queries on the database after year-end.

Table 25 : Disadvantages of using textual documentation and its countering measures in this study
The table above shows the disadvantages that may be incurred if one uses textual documentation for data collection, and the counter measures that one may apply. (These were all applied in this study.)
(McNamara, 2004a)

3.8.6. Literature review.

The literature review generated text documents that were applicable to this research. Issues that were extracted from the literature were included in questionnaire questions and interviews.

3.8.7. Questionnaires.

Various questionnaires for data collection were used in this study. The figure below sets out a typology of questionnaires (Peterson, 2000, Saunders, 2000). The highlighted blocks indicate the type of questionnaires that was used in this study. Two questionnaires were written questionnaires and two were online questionnaires. Completing the questionnaires was optional and no pressure was applied on learners to complete them.
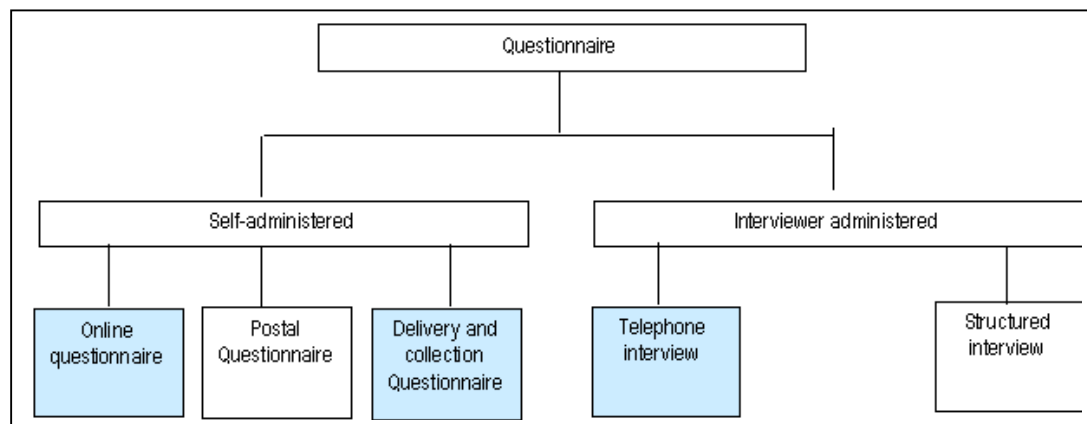
Table 26 : Types of questionnaires
The picture shows the varrious types of questionnaires possible
(Saunders, 2000)

The researcher used questionnaires as a data collection method specifically to gather information about the various subsidiary research questions (see Appendices for details of the self-administered questionnaires).

The objectives of the questionnaires were inter alia to reflect on and gather information about the learners with regard to:

- the pedagogical aspects of eLearning for high school learners
- learning community issues
- communication, collaboration and social issues
- technological and instructional design elements

When I prepared the questionnaires, I was mindful of the ethical implications of asking for participation. I therefore quite clearly stated that participation was voluntary.

The advantages of a questionnaire are that:

- it can be completely anonymous
- it is relatively inexpensive to administer
- it is easy to compare with other sources of data and to analyse
- it can be administered to a large number of people
- it can generate large amounts of data (McNamara, 2004b)

The disadvantages of using questionnaires and the countermeasures to compensate for these disadvantages are listed below (McNamara, 2004b); (Creswell, 1998, Peterson, 2000); (Krosnick, 1987).

Disadvantages of questionnaires	Countermeasures to compensate for these disadvantages in this research
Questionnaires may produce an artificially inflated amount of data. (This is known as *the ballot effect:* just because there is a question, it will attract at least some answers.)	Questions and answers are structured in a way that attempts to prevent guessing and that strives to solicit genuine opinions.
The effect of the position in a questionnaire may influence the results. (It is known that the third and fourth positions tend to attract more attention.)	The answer structure used is highly structured, i.e. a.Yes, b.tends to be yes, c.tends to be no, d.no. The position effect is thus not applicable.
Respondents might not answer questionnaire	A comprehensive range of questions was

questions carefully and thoughtfully.	included in the questionnaire. This made it possible to crosscheck for reliability.
The wording in a questionnaire could influence clients to answer in a biased manner.	The questions were framed in such a way that they would be readily understood by the learners, and care was taken to avoid words and phrases that might stimulate bias.
Questionnaires are impersonal.	At least two of the questionnaires were personally delivered to each participant.
A questionnaire doesn't give one the full story.	A large number of questions was used in an attempt to obtain as full a story as possible.
The response rate is low in questionnaires.	In this case, the response rate was over 30%. This is considered to be a good response rate. SMS messages were used to request participation.
Follow-up letters are needed with questionnaires in order to obtain a better response rate.	The computer system that is used generated these follow-up letters automatically. Telephone calls were also used to encourage learners who had agreed to participate to complete their questionnaires.
The data collected in questionnaires is limited in quantity and quality.	The broad range of questions that was asked compensated for this.
Anonymity cannot really be guaranteed when one uses questionnaires.	A learner could choose whether to include a name or remain anonymous.
The learners might not regard the questionnaire as important. The email that contains the questionnaire may go missing.	Emails were coded so that parents could immediately spot emails that were related to studies. They would consequently not be identified as trivial or personal. SMS messages were also sent to the cell phones of all learners.

Table 27 : Disadvantages of questionnaires and measures to compensate for these disadvantages (Creswell, 1998, McNamara, 2004a)

The table above outlines possible disadvantages of questionnaires and the countermeasures that were implemented to compensate for these disadvantages. (Creswell, 1998, McNamara, 2004a)

Peterson (Peterson, 2000) is of the opinion that when respondents are asked about their satisfaction or intention, they do not answer from memory but rather give an answer that is based on the particular question that is being posed. In addition, inspection of the answers commonly given to "satisfaction" questions suggests these answers are overinflated. Study participants consistently report very high levels of satisfaction. They also appear to overstate their intention to behave in certain ways. Bryant (Bryant, 1996) found that women consistently report being more satisfied than men. Because of these anomalies, Bryant suggests that considerable caution should be exercised in the construction of

satisfaction and intention questions, and that great care and caution should be exercised in their interpretation. It is preferable to direct satisfaction questions to particular concrete situations, propositions, dimensions or elements rather than to ask respondent for estimations of overall satisfaction.

Questionnaire design

When constructing the questionnaire, the researcher took particular cognisance of the work done by Schwartz (Schwarz, 1999) and Peterson (Peterson, 2000) in the construction of the questions for high school learners. Their advice is to ask questions that take the context of the learners into account. They advise one to evaluate each question by vetting each constructed question in terms of the following three questions:

- Can study participants understand the question?
- Can study participants answer the question?
- Will study participants answer the question?

Three questionnaires were developed for investigation from the student and teacher perspectives. The questionnaires are all included in the appendices.

- Questionnaire 1 – Student personality evaluation
- Questionnaire 2 – Student educational questionnaire
- Questionnaire 3 – Subject adviser educational questionnaire

Questionnaire data summary				
	Type of content	**Administered to**	**2004**	**2005**
Questionnaire 1	Personality indicator	Students	Yes	Yes
Questionnaire 2	Educational issues and personality	Students	Yes	Yes
Questionnaire 3	Educational issues and personality	Subject advisers	Yes	No

Table 28 : Questionnaire data summary
The table shows the questionnaires with their type of content, to whom it was administered and the relevant year group.

Questionnaire 1 – personality type indicator – students

The first questionnaire, which is similar to the Myers-Briggs type indicator instrument (Myers, 2004), comprised a set of questions drawn up by the researcher to obtain the basic personality profile of the learner (the questionnaire used is included in **APPENDIX 5**. It is a self-administered questionnaire that may be completed either on paper or online, and it consists entirely of closed-end questions.

A member-check form was designed on this personality profile and completed by the learner. The member-check form is included in **APPENDIX 6**.

This questionnaire was administered in 2004 and again in 2005.

Questionnaire 2 – students

The second questionnaire, presented in **APPENDIX 7**, a student questionnaire, was a self-administered questionnaire, developed by the researcher, peer-reviewed by a university lecturer and teachers. This questionnaire focused on the research questions in this study. It consisted almost entirely of closed-end questions, with four possible answers to each question. The scale of answers is a balanced number (four) of questions (Peterson, 2000) that allows for more objective questioning and evaluation.

A few input questions were asked. These mostly solicited essential biographical information. No information was either biased or embarrassing in nature. A minimum amount of writing was required in answering. Great care was taken to pitch the questions to the level of the learners, and the purpose of the questionnaire was carefully explained to the learners.

This questionnaire was administered in 2004 and again in 2005.

The following themes were included in the questionnaire, all linked to the research questions:

- Personal data

- Personality data (cross-check of questionnaire 1)

- Computer and Internet access and costs

- Help through teachers and/or the system

- Human Computer Interface

- Cognitive Science

- Creativity

- Constructivist learning

- Customization

- Control

- Collaborative learning

- Communication

- Companionship (parents – teachers roles and importance)

These constructs were repeated in the questionnaire for the subject advisers.

A total of 84 questions were included in the questionnaire. The questionnaires were handed out to students, emailed and faxed.

A summary of questionnaire questions sequenced in terms of the research subsidiary questions is presented in **APPENDIX 8**.

Questionnaire 3 – subject advisers

The third questionnaire, presented in **APPENDIX 9**, was designed for the subject advisers and online teachers. It was a self-administered questionnaire,

peer-reviewed and was similar in design to the learner questionnaire, but with the questions geared towards educators. This questionnaire was administered only in 2004.

3.8.8. Sampling procedure with questionnaires

Purposeful sampling was used (Merriam, 1998). Although all Cambridge students were invited to participate, the main focus was to get the input of the final year students because they had the most experience in the online system.

3.8.9. Analysys of questionnaires.

The questionnaires were managed and analysed with QuestionPro.com (Questionpro, 2006). A complete general overview of results are presented in **APPENDIX 10,11 and 12**. Noteworthy aspects are extracted and noted.

This study is based on data for the two years 2004 and 2005. Wherever possible the data is compared, checked and analysed to detect possible trends.

3.8.10. Computer generated log files and database content.

3.8.10.1. The webserver logs.

The webserver, which hosted the eLearning resource, generated records of three different sets of logfiles for all activity from three different programs and sources. These logfiles were comprehensively analysed and triangulated from the three different sources. A comprehensive analysis of these logfiles is provided in chapter 4. An example is included below.

Monthly Report

(**Go To**: Top: General Summary: Monthly Report: Daily Summary: Hourly Summary: Domain F
Referring Site Report: Search Word Report: Browser Report: Browser Summary: Operating Sy
Report: Request Report)

Each unit (■) represents 6,000 requests for pages or part thereof.

```
   month:     #reqs: #pages:
--------:  --------: ------:
Feb 2004:   2156823:  27866:
Mar 2004: 20088859: 209037:
Apr 2004:   4884809: 115878:
May 2004:   4707212: 157093:
Jun 2004:   6079281: 143238:
Jul 2004:   2786383: 107058:
Aug 2004:   3313879: 147267:
Sep 2004:   2088560: 103028:
Oct 2004:   2492199:  96193:
Nov 2004:   2549633:  96437:
Dec 2004:     98443:   4373:
```

Table 29 : Example of statistics on the webserver
(brainONLINE, 2004a)

3.8.10.2. The eLearning resource log files.

Apart from webserver logs that were logged by the webserver, the eLearning

resource itself kept track of a different set of user activity in its own logfiles.

These logfiles were analysed. Unfortunately there were a number of kinds of

data that were not logged. Although these are unavailable for this research, the

suggestion that they be used in future research forms part of the

recommendations at the end of this study.

An example of logfiles kept by the eLearning program is shown below.

Table 30 : Example of the eLearning program logfiles
The figure shows an example of the eLearning program logfiles
(brainONLINE, 2004a)

Apart from an analysis of the logfiles, I conducted a detailed investigation of the database and gathered a comprehensive amount of data from it that now forms part of the eLearning resource. I compared the data that I had gathered from the database statistically with the data that I had gathered from the questionnaires.

Acquiring the online data from the eLearning database

Copies were made of the existing database tables of discussions and posts. The tables are named mdl_forum_discussion and mdl_forum_posts. Microsoft Access, with ODBC (Webopedia.com, 2006) drivers were used to view the tables and create the information from SQL statements (SQL.org, 2006), which was saved in Microsoft Excel.

A variety of data extractions were possible. Around 60 different queries in SQL were run. Out of these the data in the following section was extracted.

The complete dataset and the resultant Microsoft Excel files are included on the DVD. An example of data and SQL statements is given below.

Chat and forum post summary_analysed.xls

	A	D	E	F	G	H	I	J
1			32683	2275	1644	Total female chat	Total female posts	total female replies
2								
3	username	Gender	Number of Chats	Forum Posts	Forum Replies	32683	2217	1612
4	z2147	F	5834	123	103			
5	z2250	F	5654	54	52			
7	z2141	M	1536	7	5	SQL		
8	z2215	M	1410	81	78			
9	z2162	M	1266	33	27			
10	z660							
11	z2151							
12	z2124							
13	z2200							
14	z2201							
15	z2246							
16	z2209							
17	z2140							
18	z2142							
19	z2193							
20	z2224							

Johannes Cronje:

```
SELECT [Cambridge students dataset].username, [Cambridge
students dataset].lastname, [Cambridge students
dataset].firstname, [Cambridge students dataset].Gender,
[Number of chats per student].NumberofChats, [Number of
forum posts per student].CountOfid AS NumberofForumPosts,
[Number of forum replies per student].CountOfid AS
NumberofForumReplies
FROM (([Cambridge students dataset] LEFT JOIN [Number of
chats per student] ON [Cambridge students dataset].id =
[Number of chats per student].id) LEFT JOIN [Number of forum
posts per student] ON [Cambridge students dataset].id =
[Number of forum posts per student].id) LEFT JOIN [Number of
forum replies per student] ON [Cambridge students dataset].id
= [Number of forum replies per student].id;
```

Table 31 : An example of data extracted from the eLearning database, with SQL
The figure shows an example of data extracted from the raw eLearning databases, including SQL statements, gathered in a Microsoft Excel file.

3.8.11. Interviews.

Interviews are particularly useful for trying to discover the context of a participant's experiences (McNamara, 2004a). Interviews give a researcher a method for pursuing in-depth information on a particular topic. Interviews can be useful as a follow-up to responses in questionnaires because they enable the researcher to obtain more detailed information about particular responses. Open-ended questions are usually used in interviews because questions of this kind are more likely to elicit the kind of rich, thick and layered descriptions that are sought in qualitative research. I used focus group interviews in this research.

3.8.11.1. Focus groups.

The epistemological implication of a focus group is that it generates meaningful data among people by means of interactions that are stimulated by questions

and answers (Mason, 2002). In a focus group, therefore, a researcher can generate interactions by introducing topics and by letting the group discuss them. The interviewer can take cues from the group as to what to ask next. The focus group discussion in this research provided a good example of how questions and answers can generate data in the hands of a skilful interviewer. It was appropriate to use an external interviewer in a semi-structured interviewing format because the interviewer concerned has no direct interest in the material outcome of the discussions (he was not biased in favour of any particular point of view). Group interactions give participants time to think about the topic and opportunities to take cues from other participants. This provides rich data. Transcripts of focus group interviews were used to corroborate evidence obtained from one with evidence obtained from other focus group interviews.

Although focus groups are a form of group interviewing, it is important to pinpoint the differences. A group interview takes place with a group and an interviewer. The group dynamic in a group interview is generated by questions from the interviewer and responses to these questions on the part of participants. By contrast, the purpose of focus groups is to generate interactions within the group itself as a result of questions that are asked by the interviewer and the moderator. The focus group therefore entails discussions within a group of selected participants with a view to obtaining their opinions about and experience of a specific topic. The data delivered by a focus group will be rather different from the kind of data that a group interview delivers (Gibbs, 1997).
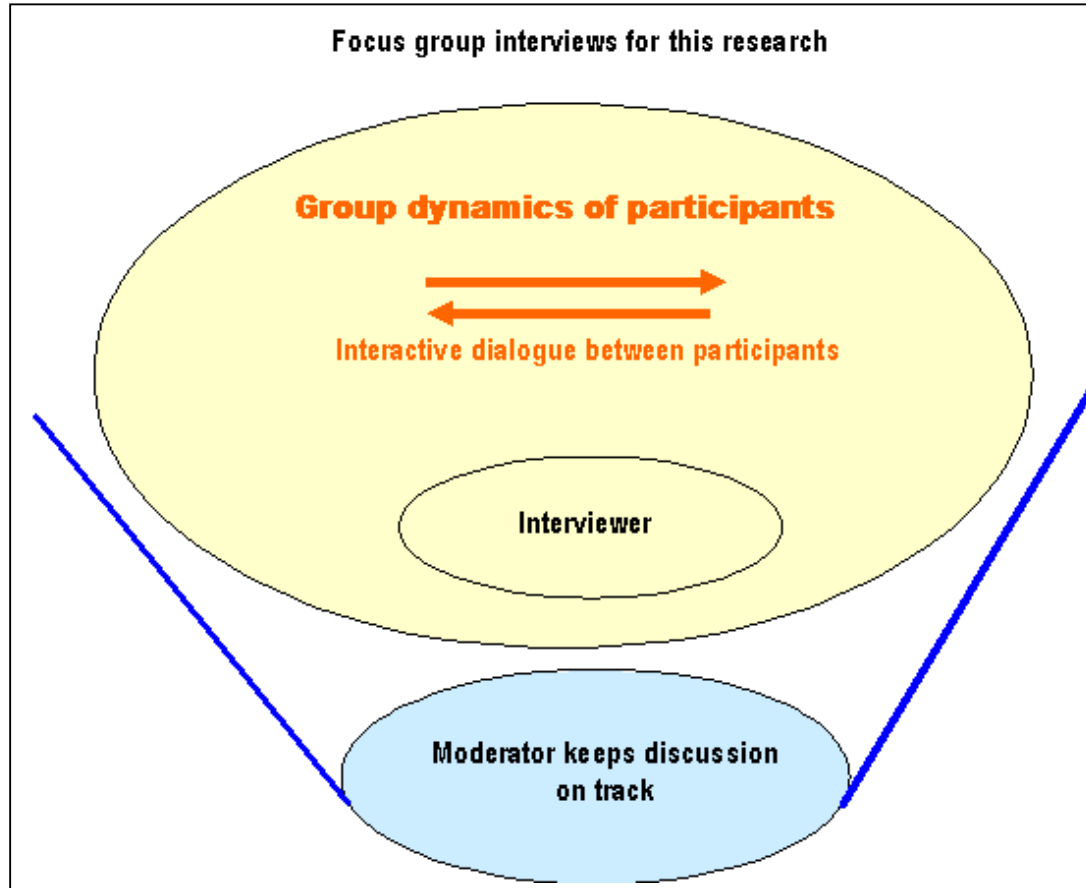
Table 32 : Focus group interviews for this research - a graphical depiction by the researcher
This figure depicts the role of the moderator, interviewer and the group in a focus group dialogue

The complete text and audio files of the focus group interviews are available on the DVD. A summary of the focus group interview analysis is presented in **APPENDIX 13.**

3.9. Implementation of the case study

Various points about the implementation of the case study are presented in the following section.

3.9.1. Setting up the system - Choosing an eLearning interface – objectives.

Platform used

The eLearning platform used is Moodle. The choice is based on information outlined in the literature review.

I investigated eLearning platforms available in the market since 2000. The systems ranged from high-end, expensive systems such as WebCT (WebCT, 2006) and Blackboard (Blackboard, 2006), who merged during 2005, down to open source software since 2000 (OpenSourceInitiative, 2004), which is free, and which includes the source code.

Aims and purpose of implementing the eLearning platform in the researched organisation

In general, it can be said that the aims of implementing the eLearning platform was firstly an administrative supportive decision. Pedagogical objectives per se were not the initial aims. My reasoning was that if similar interfaces worked for universities, they must be important, and the benefits would appear automatically. The assumption was made that the first year may be a year during which everybody would learn and in which technical issues and basic issues would be prevalent. The study shows that it was a year of learning and the benefits took time to transpire. The second year showed an increased acceptance and participation.

Pedagogical and educational aims of the system were taken care of inside each subject.

The overarching aims on the educational side of the system are "analysis and evaluation" which are embedded in the design and content of the course material. This is probably in contrast to "old paradigm" aims of knowledge regurgitation (Cronje, 2006a). Very clear assessment objectives were linked to the syllabus aims (Examinations, 2006). The capabilities and features of the eLearning system supported these.

3.9.2. Implementation the basic hardware and software systems.

Webserver

For software the following was used : LAMP (short for Linux (Linux, 2004), Apache (Apache, 2004), MySql (MySql, 2004) and PHP (PHP, 2004)). Linux is the operating system, specifically RedHat Linux version 9. Apache is webserver software version 1.33. MySql is a database system version 4 and PHP is a scripting language version 4.3. All of the above are free and open source.

Webserver hardware (2004,2005)

The following hardware was implemented: 2.4 Gigaherz processor "PC" compatible webserver (upgraded to 4gig in 2006), 512MB Ram (upgraded to 2Gig in 2006), Two 80GByte hard drives (upgraded with an additional 80Gig in 2006) that are mirrored as a backup(for unforeseen events) with backups being made once a week.

Webhosting

The eLearning resource was placed on a local Internet network (Hetzner, 2004). The service chosen was a dedicated plan where the computer is owned by the company and is just plugged into the Internet service provider's network.

3.9.3. Setting up the system - course materials.

Available materials ported to the eLearning interface

The existing system, before adding the eLearning implementation, utilised a CD, which is distributed to students, with all the course materials on the CD. Porting the courseware to the eLearning interface entailed outputting all the material to pdf format (Adobe_Systems, 2004).

3.9.4. Introducing the eLearning platform to the users, subject advisers and admininstrative staff.

Training session with subject advisers and administrative personnel

Two training sessions were held, one late in December 2003 and another during January 2004. On both occasions, the training sessions were recorded as tutorials and made available on CD. The subject advisers could then replay specific sections of the training sessions as required (brainONLINE, 2004b).

Training session with students

A training session was held for students in January 2004 and 2005. A specific "Open Day" was held early in the year and all parents and students were invited to visit the premises.

Face-to-face meetings

The "Open Day" was also an opportunity for students to meet other students. An effort was made for the students to exchange contact details and socialize. During 2004 and 2005 four workshops were held during which students could live in the institution for the two-week sessions. During their stay they socialised and worked through the content specified for the period.

3.9.5. Accessing course content.

Course content access was not used excessively in the system, mainly because it was provided on CD. Because the cost of Internet access is excessively expensive in South Africa, students used the CD instead. Compared to other systems (Ong, 2003), this study does not provide data on patterns of content access.
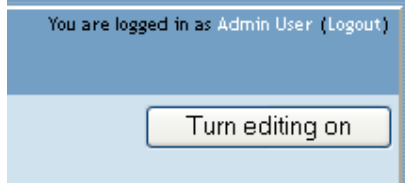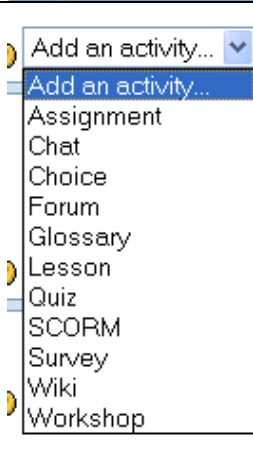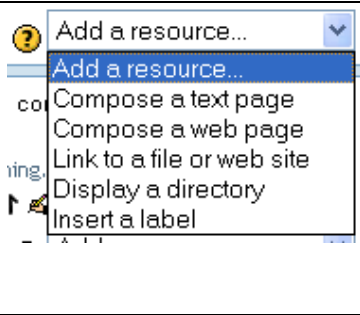
3.10. What does the eLearning environment look like.

Some exhibits of the most important features of the eLearning resource are shown. For a complete view, the Moodle website can be visited at

www.moodle.org

Description of feature	View of online resource
Allows for unlimited forums to be created and used in courses	Main Menu **Communicate-Praat** General news Cambridge news Ask a question (Helpdesk) **Lounges-Sitkamers**
It has an interactive dynamic calender which include user, course and global events	Calendar April 2006 Sun Mon Tue Wed Thu Fri Sat 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Instant messaging allows for realtime communication between online users	Hazel C Makumba Add contact Block contact Message History : hello this is hazel.i was just asking,if i stay in botswana and want tocome for the workweek and dont know where it is is brainline going to give us directions because i dont know where it is and how do i book in for the work week clases : Hi there. send an email to rose@brainline.com and she will direct you, or you can phone her 012 543-5000 Send message

Designing, implementing and maintaining a course is relatively easy, with a WYSIWYG interface	You are logged in as Admin User (Logout) Turn editing on
Unlimited chat-rooms can be created in courses	💬 Chat room
A variety of tools are available Including Assignment Chat rooms Choice (voting) Discussion forums Glossary Lesson sequences Quizzes Surveys Workshops	Add an activity... ▼ Add an activity... Assignment Chat Choice Forum Glossary Lesson Quiz SCORM Survey Wiki Workshop
Resources can be added including Text pages Web pages Links Directory repositories Labels to enhance layout	Add a resource... ▼ Add a resource... Compose a text page Compose a web page Link to a file or web site Display a directory Insert a label

Table 33 : Overview of online resource capabilities

The table shows some of the capabilities of the online resource used in this research

3.11. Limitations and delimitations of the study.

Any study has a particular set of assumptions as a point of departure. This

means that other theoretical or philosophical perspectives are excluded.

Input from the field of Educational Psychology into this study is present, but to a limited extent. Future studies may add more insights from this important field.

The study only focused on a single case study. Although that in itself is sufficient, I would have preferred to widen the scope to more than one case.

Questionnaires were only sent out for the groups in 2004 and 2005. In the year 2006, research could not run for a full year. If it had run for that full year, more reliability may have added to the study.

An attempt was made to include all the learners. Due to logistical and administrative factors, this was not possible. However, most of the students in the course participated.

Students who are enrolled were mostly home schoolers. There are, however, some learners who attend micro-schools (Cronje, 2006a). A micro-school is a small private school, usually with just one or more teachers, with students of multiple ages in one room. It is similar to the USA Historic One-Room schools (Bial, 2004) It would be interesting to investigate the differences between home schoolers and microschoolers. Such an investigation is not included in this research, but can be part of future research.

No literature review can purport to be absolutely complete. In a very popular field like eLearning this may even be more true. I had the privilege and benefit of gaining access to the meta-studies by Cavanaugh (Cavanaugh, 2004b) and Bernard (Bernard, 2004). Although I did as thorough a search as possible, there

may be information that has not been included in the study because of the rapid expansion and publication of information about eLearning.

In attempting to answer the research question I have chosen to explore a broad rather than a narrow range of aspects that may be relevant for arriving at answers to the research question. A narrow view may limit the potential for arriving at answers by not allowing the input of the users to cover a wide variety of possibilities. The possibility exists that the range of choices made may still be too narrow.

3.12. Issues of validity, reliability, procedures of authenticity and trustworthiness.

3.12.1.1. Member checking, peer reviews and crystalization.

In qualitative research it is better to talk of crystallization instead of triangulation (Denzin, 2000). Crystallization is a qualitative alternative to triangulation in quantitative research. There is a combination of multiple methodological practices, empirical materials, perspectives and observations in this study because such a strategy adds rigor, breadth, complexity, richness and depth and these constitute crystallization.

Member checking and peer reviews were also used. The story of this research is told from the different points of view of the creators, the students, the facilitators, the administrators, the technical personnel. All of these add up to Richardson's multiple points of view (Richardson, 2000).

Although nothing involving humans is perfectly repeatable, the aim of the

research is to be repeatable to a reasonable extent (Stake, 2000). The vigorous self-reflection and introspection of the researcher (which hopefully becomes visible throughout the research) may also work positively towards more objective analysis and interpretation.

3.13. Summary.

This research attempts to answer the question: "To what extent and why certain [are] features of a high school eLearning resource workable and desirable for sustaining a high school learning community?"

The research is designed to extract information about the eLearning resource and the eLearning community to yield information about the kind of elements in an eLearning resource that will best support a learning community of high school learners.

The intellectual research puzzle set out the main research question, subsidiary questions and objectives. In addition, a research strategy and research design address the research questions.

The methods applied include observation, analysis of written texts, various questionnaires, focus group interviews with an external interviewer, interviews by the researcher, and telephone interviews. The data gathered in the resource repository has also been analysed.

For every method used, the related collection instrument with its concomitant objectives, advantages and disadvantages is explained. Corrective measures to counterbalance the disadvantages are described. Member checks, peer reviews,

crystallization, and investigator triangulation have been used to ascertain levels of trustworthiness and authenticity in the study.