

Chapter 1
Introduction, background and research
problem

Chapter 2
Literature review

Chapter 3
Research design and methodology

Chapter 4
Analysing the case, evidence and
discussion

Chapter 5
Conclusions and recommendations



5. CHAPTER 5 CONCLUSION AND RECOMMENDATIONS

5.1. Introduction

This chapter begins with a summary of the main and subsidiary research questions, the literature review and the research design. What can be learned from this research will then be presented in the discussion section. At the end, recommendations for further research, policy making and practice will be suggested.

5.2. Summary

This section summarizes the research. The research question and sub-questions together with their results are shown.

The study focuses on the following research question:

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

In order to find an answer to this question, the following subsidiary questions were asked :

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 eLearning resource?

Chapter 2 explored the literature that is relevant to the question. Throughout the literature review, positive pointers (62) and negative pointers (20) towards answers were indicated. The main themes cover pedagogical, community-, communicative- and technical aspects.

In chapter 3 the detailed research design was presented. The research design took the form of a predominantly qualitative case study because this type of research can contribute to an in-depth understanding of the features of an eLearning resource. The case study on which the research was based was conducted over a period of two years (2004 and 2005) and the subjects were high school learners enrolled for an online eLearning course.

Chapter 4 detailed the findings of the researched case study in a way that was designed to arrive at answers to the subsidiary questions. Forty-two research findings were distilled and presented in sequence throughout the chapter. Together the answers thus obtained contributed to answering the main research question.

5.3. The answers to the subsidiary questions

This section provides the core of each answer.

I agree with Mayer (Mayer, 2003) that while eLearning is a science that is still in its infancy, it has nevertheless become a science in its own right. The answer to the question about how various theories influence an eLearning resource will become apparent with the passing of time because new eLearning models are constantly being devised and tested. After synthesising and extrapolating from existing eLearning definitions in the literature, I created this new definition of high school eLearning:

High school elearning means learning via the Internet through interacting and constructing meaning with others using resources in a learning community specifically attuned to the needs of high school learners.

The verbs “interacting” and “constructing” point to the most important features of this definition. These activities should take place inside a caring community.

Several eLearning theories offer their own explanations of how one should understand this interacting, constructing and community. I investigated a selection of theories on the basis of their relevance to this study. The most useful of these models were:

- the Design Maturity Model (Maturity Model) by Neuhauser (Neuhauser, 2004) that offers a detailed path that one may follow if one wishes to improve any eLearning project
- the models dealing with the importance of creating an online “community”, namely the Community of Inquiry model developed by

Garrison and Anderson (Garrison, 2003), the Community-central model of Palloff and Pratt (Palloff, 2001), the Learner-teacher-content model of Anderson (Anderson, 2004d) that combines and emphasises individual learning and learning with a community as the two most important elements of a learning community

- the Cognitive Theory of Multimedia Learning (Mayer, 2001a) **that** attempts to explain how people learn

The pedagogical learning theories that I investigated fell into three main categories – behaviourist, cognitive, and constructivist – and I focused especially on the latter two. It seemed to me that the best solution lay in merging behavioural and constructivist approaches in accordance with the theory of Cronje (Cronje, 2001, Cronje, 2000) who confirms that it is possible constructively to integrate in practice the apparently diametrically opposed methods of objectivism (including behaviourism) and constructivism. This harmonisation of methods that are traditionally regarded as irreconcilable was pioneered by Bruckman (Bruckman, 2003) when she scaffolded constructionist courses with conventional external (behaviourist) motivation.

De Villiers (De Villiers, 1999) devised a concise model of cognitive instructional theory that she calls the Hexa-C Metamodel of Cognitive Instructional Theory and Design. Her model is constructed from the following six components: cognitive science, constructivism, component-based instruction, customisation, creativity and collaboration.

The eLearning resource implemented in this research, a modified version of Moodle, possesses certain features that more or less resemble those found in most other eLearning resources. The question then becomes how and why such

features can be used to promote high school eLearning.

The first question to be answered is: How did the learners think that this eLearning resource worked in terms of pedagogical theories?.

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

The overall academic performance of the subjects was favourable. This means that the particular pedagogical theories and eLearning theories that were implemented in the eLearning resource did contribute in some way to helping the participating students to succeed in their examinations (Research finding 1).

It is the opinion of the learners and subject advisors that Cognitive Science Theory elements, Constructivist Learning Theory elements, and Component Display Theory elements are supported by the eLearning resource. No particular feature stood out as being specifically responsible for this. Features in eLearning resources in general may thus produce the same results (Research finding 2, 3, 4).

While the learners and subject advisors regarded customization as important, the eLearning resource only allowed them to implement a limited amount of customization (Research finding 5). The eLearning environment as a whole might therefore be regarded as making allowance for personal creativity (Research finding 6).

But more important than this was the fact that the eLearning environment provided an environment that challenged learners to develop and nurture their

own motivation (Research finding 6).

The eLearning resource also suited those learners who were more independent and mature than the average (Research finding 6). While learners appreciated the value of collaboration, it emerged that they preferred on the whole to work alone rather than together with other learners (Research finding 7).

Companionship (i.e. presence and support of other human beings) was the most important element in the eLearning resource (Research finding 8). At present I regard companionship in all its forms as the single most important and promising eLearning feature for making an eLearning resource for high school learners desirable and workable.

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

The respondents indicated that the feeling of belonging to a community important. The longer learners are exposed to this particular eLearning resource, the better it seems to work for them. Learners experienced an increased sense of community between their first year and second year of enrolment (Research finding 9).

The learning community itself engenders a feeling of safety, care and openness in its users (Research finding 14). These positive emotions are enhanced by face-to-face meetings that promote a sense of community and serve to bind the community together (Research finding 16).

The learners in the sample had strong individualistic inclinations (Research

finding 10). Peer pressure did not play a significant role in the lives of these learners (Research finding 11) and they are averse to competition (Research finding 13). It therefore comes as no surprise then that the learners do not prefer group work (Research finding 12). The structure of the eLearning resource and community made it possible for learners to have a wider range of friends than they could have had in any conventional school (Research finding 15).

The range of personality types among participants is more or less balanced, with no particular traits (such as introversion or extraversion) predominating. The “Thinking” (71%) and “Perceiving” (68%) traits are the only ones indicated by approximately two thirds of the learners (Research finding 17). (This may link this research finding to Research finding 10 which shows that this group of learners had very strong individualistic inclinations.)

While the pattern of study activity that learners followed was similar in 2004 (the first year of implementation) to patterns found in a conventional school, this changed in 2005 to a pattern of increased activity in the afternoons and evenings (Research finding 18). This may show that as learners became more familiar with the facilities of the interface, they were able to adapt their information behaviour patterns to suit their needs and priorities. While the subject advisers worked mostly in the mornings in the first year of implementation (2004), their pattern of usage in the second year (2005) changed to one of work mainly in the evenings (Research finding 19).

The online interaction between learners and subject advisers followed an asynchronous pattern, with the learners either being active in the mornings or afternoons and the subject advisers being active mostly in the evenings (Research finding 20).

The average online class size was 57 and 62 learners per class in 2004 and 2005 respectively (Research finding 21). The ratio of learners per subject adviser was 223 to 1 (Research finding 22). This shows that a substantial increase in economies of scale between regular schooling and “successful” eLearning is possible.

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

Fewer than half the learners claimed to be adequately exploiting the possibilities for communication inherent in the eLearning resource (Research finding 23). The implication of this is that the communication features of the eLearning resource were not being used to the full. The reason for this might be that learners need more time to become familiar with the interface or alternatively that they have no need of more interaction and communication.

Analysis showed that only about one third of the discussions related to academic matters (Research finding 29). While this may be explained by the avowed academic individualism of the learners (Research finding 10), it also reveals a strong need for socialising.

The gender spread in terms of academic discussion participation is about equal (50%-50%). This is very different to that which accompanies chat activity – where female learners contributed most of the traffic volume (Research finding 30).

Learners used chat rooms mostly to socialize (Research finding 27) to an even greater extent than they used discussions (Research finding 29) for the same

purpose. Female learners chatted to a far greater extent than did their male counterparts (approximately 50% more) (Research finding 28). On average, learners contributed 174 chat posts per year, approximately 14 forum posts per year, and about nine forum replies per year (Research finding 31).

Approximately half of the learners were active contributors and half were isolated learners will contributed almost nothing (Research finding 32). Also, only about one third of the learners added a photograph or a symbolic image (“icon”) of themselves to their profiles (Research finding 42). While the percentage of learners who “lurked” was about 40% initially, this percentage decreased by around 25% in the two-year period (Research finding 33). This seems to indicate that having more time encourages lurkers to contribute.

Learners preferred mainly to be contacted by email for any matter relating to learning. A smaller number preferred to be contacted by means of a conventional (landline) telephone call, and an increasing number preferred to be contacted on their mobile telephones (Research finding 24). While most learners (83%) owned a cellular phone, their reachability rate is only about 50% – despite the fact that approximately 80% agreed that their numbers had not changed (Research finding 25). Almost all emails (92-94%) were successfully mailed. But this high delivery rate does not mean that they were necessarily read (Research finding 26).

5.3.4. To what extent and why do certain technological aspects and instructional design issues affect a high school eLearning resource?

Both learners and subject advisers were highly computer-literate and displayed

positive attitudes towards both the medium itself and the eLearning resource (Research finding 34). In spite of this, it is still necessary to set certain minimum hardware requirements for those who wish to enrol (Research finding 41).

Because any eLearning system of this size and complexity needs constant updating, it is necessary to have access to the services of reliable technical experts who will continuously upgrade and maintain the resource (Research finding 35).

Web servers inside the local country usually offer better connection speeds (Research finding 36).

The average size of a file of course material was 72 kilobytes. It took 5,5 hours to upload 1.1 gigabytes of data in 16 000 lessons in South Africa in 2005 (Research finding 37).

Hack attacks and viruses can waste large amounts of bandwidth and so increase running costs (Research finding 38).

The employment of personnel in an eLearning team who can program is an advantage because the automated course creation of 74 courses saved approximately 1300 hours of human labour and around US\$11 000 in South Africa in 2005 (Research finding 39).

Course development costs in the researched institution were significantly lower than would have been abroad (US\$3 000 in South Africa, for example, as opposed to US\$88 000 in the United States) (Research finding 40).

5.4. Discussion

This section discusses what lessons can be learned from this research. It takes the form of a reflection which one may define as a calm, measured and intense consideration of an object, process or event (in this case, this research). The reflection will deal with methodological, substantive and scientific issues.

5.4.1. Methodological reflection

To what extent has the research approach influenced the results? (What, for example, are the trade-offs of the choices that were made? Did the approach allow for a sufficient number of nuances? Were all relevant matters addressed?)

I am satisfied that I explored the operation of an eLearning in a high school in a way that was most intensive and extensive. In so doing, I utilised a mixed method approach and an instrumental case study to investigate the performance of an eLearning resource as it sustained a high school learning community.

While I used mainly qualitative methods, I supplemented them with quantitative methods that involved the administration of a number of questionnaires.

Although a great deal of thought went into rephrasing the pertinent educational jargon so that it would be intelligible to learners of a school-going age, the possibility remains that the some of the participants might simply have been too young to have formed any meaningful opinions about some of issues. In spite of this possibility, their answers revealed the necessary depth of understanding.

Their answers in the quantitative side of the research were cross-checked

(crystallized) by data from the qualitative component of the research.

In chapter 3, I considered each data collection instrument used in this study in detail, together with the possible disadvantages of each one. I also described the corrective measures that I put in place to compensate for these deficiencies.

In setting up the research I thought it best not to repeat the frequently used (and my opinion useless) pre-test post-test research approach. The Clark (2000) – Kozma (1994) – Russel (1999) debate is ongoing in this regard. Instead I opted for an in-depth case study.

In answering the research question, I utilised four broad theoretical approaches. Although I might have equally well have made use of various other points of view in this research, the literature showed that most research at present can be located somewhere in the pedagogics, community, communication and technology.

I compared the results of the qualitative methods from the focus group results with the results of the quantitative questionnaires. I used member checks, peer reviews and crystallization to ensure trustworthiness and authenticity.

I strongly doubt whether the results would have been different if I had used more quantitative research. It may nevertheless be true to say that more in-depth qualitative research might have enabled me to answer the WHY questions more persuasively.

5.4.2. Substantive reflection

I compared the results of this research to other research on the same topic and related the outcomes of this study to other available knowledge in this area. I discussed the literature that I found after I had closed the literature review in the conceptualization phase of the study.

In order to aid my substantive reflection on the research, I developed a data collection matrix or intellectual puzzle. This device enables one to tabulate research questions, literature review findings and the research findings (and their implications) in one table. It is presented at the end of this chapter.

I agree with Cavanaugh (Cavanaugh, 2004b) that eLearning may be unique for learners of school-going age and that the principles derived from adult learning may not be directly applicable. An eLearning resource for school-going learners should be different from one used for adult learners – or else one's strategy in implementing the resource should at least be carefully suited to the targeted users. But for learners who are as fiercely independent as are those in this research group, an eLearning resource that is tailor-made for university students may in my opinion be especially appropriate rather than disadvantageous.

The majority of learners in this study indicated that they are very independent and that they do not need much support. Perhaps this fact explains why an eLearning resource like the one employed in this research (Moodle, 2004), which was designed for adult learners, still worked for these learners. It would nevertheless probably be better in most cases to use an eLearning resource that has been especially designed for learners of school-going age.

When it came to eLearning models, I found that The Maturity Model of Neuhauser (Neuhauser, 2004) offered an eLearning development pathway and

stages that I found to be particularly useful. During the two years of implementation, for example, I identified a definite movement along the pathway suggested by Neuhauser. These models all offer important glimpses into what are supposed to be the components of an eLearning resource and how they can be used. It is my personal conviction that the eLearning resource (and its concomitant eLearning) will not become obsolete in the future but that it may mature into an even more effective tool of learning – especially if used in combination with mobile telephones and Personal Digital Assistants.

About pedagogical theories

De Villiers (De Villiers, 2002) investigated current directions and developments in learning theories and presented the information she found in a concise model that she called the Hexa-C Metamodel of Instructional Theory and Design. In this research the learners responded in a mainly positive way to the six components that De Villiers identify in her model, namely cognitive science, constructivism, component-based instruction, customisation, creativity, and collaboration. This meta study therefore provides a concise and compact staging point from which to evaluate the pedagogical components of the research.

In general, the learners and subject advisors reported positively on the importance of the elements of pedagogical theories, and agreed that they were all desirable in an eLearning resource. This may also be deduced from the fact that the learners' overall academic performance in the final examinations, administered externally under the auspices and authority of Cambridge University International Examinations, was favourable (Research finding 1).

Cognitive science

Cassel (Cassel, 2002) found that meta cognition is possible for children, one may

say that cognitive science theory elements are supported by this eLearning resource. I also agree with Scardamalia (Scardamalia, 2004) that higher order thinking is possible. She found that open-ended online assignments resulted in higher order thinking. Just like the learners in this research, Levin (Levin, 2002) found that reflection creates a link between theory and practice that breaks down the isolation of the conventional classroom (Carrager, 2003).

While I agree with Beal (Beal, 2002) on the possibility of obtaining benefits accrued from behaviouristic-style rote learning, I am also in agreement with Huffaker (Huffaker, 2003) who says that when it is applied too lavishly, it is no longer beneficial.

Constructivism

The learners agreed that constructivist learning theory elements (as paraphrased to accommodate their understanding) play an important role in an eLearning resource. I nevertheless agree with Fisher (Fisher, 2002) that it is difficult to implement them because online learning must be anchored, contextualised and useful in practice – and that implies the expenditure of a great deal of planning and time. But constructivist learning also requires an input of effort from learners. Wentzel (Wentzel, 2000) and Henning (Henning, 2002) found, for examples, that students may strongly resist a constructivist approach in favour of being “spoon-fed” by means of the more conventional lecturing approach that offers students predigested units of information that require no critical exertion on the part of the students. It is clear that some students do not like to be disturbed in the familiar “comfort-zones” of conventional face-to-face education. Khine found that the students in his research preferred information acquisition to constructivist engagement (Khine, 2003), and Hendricks found that student discussions centred on sharing and comparing information rather than on constructing knowledge (Hendriks, 2004).

Czerniewic (Czerniewicz, 2001) and Le Roux (Le Roux, 2003) are in all probability correct when they say that bright and independent learners seem to benefit more from constructivist approaches online because designing and using online courses may require more imagination and skill than do traditional courses (Czerniewicz, 2001). The students who have made a success of the courses in this research were from privileged backgrounds and they had a sensitive understanding of what was demanded from them academically.

Creativity – motivation

The learners in this research strongly agreed that the eLearning system was workable and desirable in terms of creativity and motivation and they added that the eLearning resource made allowance for personal creativity and provided an environment that challenged them to develop and nurture their own motivation. I agree with Wagner (Wagner, 1998) that this effect of a resource is better appreciated by learners who are more independent and mature than average learners elsewhere. On the basis of what Wagner also said about good attitudes and stable emotions (namely, that they are indicators of creativity), I am able to say that the resource used by the students facilitated creativity. I also agree with De Villiers (De Villiers, 2002) that if instruction inspires, encourages and motivates learners to take risks and rely on their own resources, abilities and expertise, then that would be good instruction. And I agree with Dreyfus (Dreyfus, 2001) that positive emotions engender higher levels of motivation in online learning and that such levels correlate positively with success in handling the medium effectively. It is nevertheless also logically apparent that the opposite is also likely.

Customization

While I regarded customization to be important, the eLearning resource only

permitted a limited amount of customization. The learners did not indicate that this hindered them in any way. But in future this may be an element of great importance as web-logs, instant messaging and mobile telephone devices become more prominent and are more frequently used in conjunction with learning.

Companionship

The learners in this research indicated that companionship (i.e. with other human beings) is the most important element in the eLearning resource. I concur with Klicka (Klicka, 1995) and Harris (Harris, 1995) who believe that companionship is a significant contributor to success in home schooling (which constituted the learning environment of most of the learners in this research).

Closely related to this concept is the role of facilitators and moderators or mentors, and the literature in general is very clear about the importance of these functions. I agree with the conclusion reached by Cavanaugh (Cavanaugh, 2004a) in her meta study that teacher quality is the one factor that requires special consideration in virtual schooling. I also agree with Darling-Hammond (Darling-Hammond, 2000) who found that teacher effectiveness determines success in eLearning to a far greater extent than do differences in class size and heterogeneity. It is vital in my opinion not to underestimate or overlook the importance of the human element. This is corroborated by implication by Cavanaugh (Cavanaugh, 2004a). When she detected similarities in student outcomes between distance and classroom learning, she drew the conclusion that teacher preparation is critical in distance education. I also support the opinion of Adendorff (Adendorff, 2004), whose view coincides with that of Cavanaugh, when she notes that there is a growing body of knowledge about the new roles that online instructors have to assume. Adendorff delineates the



following five important roles: administrator, social supporter, instructor, guide and mediator (Adendorff, 2004).

Loken's research (Loken, 2004) supports the crucial importance of companionship in virtual schooling. Loken found, for example, that if their progress of students is sympathetically observed by a mentor, students become more active in their studies and devote more time to studying. I concur with Horton (Horton, 2000) that an online companion needs to be capable of expressing emotional support and empathy. This in effect means that a mentor needs to be caring and able to listen attentively to others. He or she should also be skilled in understanding the meanings and intentions of other people and be able to endure insults and cope with misunderstandings. A mentor above all needs to be able to deal sympathetically but effectively with emotional and practical problems and difficulties.

Further support for the importance of companionship comes from Dreyfus (Dreyfus, 2001) who writes: "Mastery" (an advanced stage of learning) can only be achieved through apprenticeship, which takes time and a special kind of involvement." (author's emphasis)

Community aspects

The most important finding about community is that the learners in this research experienced the learning community as a community characterised by safety, care and openness. This coincides with the findings in the literature about how an effective learning community should be. In numerous sources such as Jonassen ((Jonassen, 1993b), Scardamalia (Scardamalia, 2004), Pratt (Pratt, 1997), Pallof (Palloff, 1999), Lin (Lin, 2001) and others, we find descriptions of community as places (virtual or otherwise) in which learners take part in lively interactions, in collaboration from an independent base, in discourse and discussion, in the sharing of information and in building quality learning experiences in an atmosphere of openness and involvement. There appeared to be a growth in the sense of community of those using the resource because learners reported an increased sense of community between the first year and the second year (Research finding 9).

The role of the online instructors appears to be a factor of crucial importance in the answer as to why certain elements in an eLearning resource contribute to sustaining high school learning. I agree emphatically with Cavanaugh (Cavanaugh, 2004a) when she writes in her meta-analysis that teachers play a critical role in high school eLearning. I also agree with Darling-Hammond (Cavanaugh, 2004a, Darling-Hammond, 2000) that teacher effectiveness in classrooms is a strong determinant of differences in student learning and that it far outweighs the differences in class size and heterogeneity as determining factors. For the learners in this study, most of whom were engaged in some form of home schooling, parents played an equally crucial role in the absence of conventional school teachers.

I concur with Anderson's (Anderson, 2001) description of the three critical roles of an online instructor. In Anderson's view, an online instructor needs to be a good designer of learning experiences as well as someone one who is able to encourage discourse and give direct instruction. The learners who participated in this research indicated that all these activities were discernible in the online instruction that they received.

The learners in this research were very clear that while they stood and appreciated the value of collaboration, they had no preference for group work (finding 12) but preferred rather to work alone instead of with other learners (finding 7). It also became apparent from the interviews that peer pressure does not play a role in their lives (finding 11), and they have no liking for the kind of competition that one usually finds in group work (finding 13). Yu's (Yu, 2001) research provides evidence that competition does not promote cooperation. I personally suspect that the pitfalls and dangers of collaborative discussions described by Horton (Horton, 2000), which include spamming, e-mail bombing, spoofing (pretending to be somebody else), flaming (abusiveness) and the domination of discussions by particular individuals, may all contribute in various ways to the aversion that most of the pupils felt for group work. While Horton found that collaboration energises learners (Horton, 2000), I am of the opinion that that may be true for learners with specific personality configurations because Flynn (Flynn, 2001) found that learners who expressed a preference for group work (probably those who are energized by others) in discussions indicated that they would like to engage in group work again.

I agree with Czerniewicz (Czerniewicz, 2001) that collaboration is more mere group interaction alone and that for collaboration to work it must have a discernible purpose and be clearly guided. If collaboration is not carefully

planned and guided, collaboration may simply take up too much time and that in itself may discourage this activity.

When a learning community creates a sense and feeling of safety, care and openness (finding 14), it becomes possible for learners to make a wide range of friends (finding 15). It is in such circumstances that face-to-face meetings enhance the sense of community and serve to bind it together (finding 16). This concurs with the research findings of Yuen (Yuen, 2003), Hiltz (Hiltz, 1996) and Schulze (Schulze, 2000) who felt that eLearning should include face-to-face encounters where possible. I agree with Engelbrecht (Engelbrecht, 2003) that face-to-face meetings may help online instructors to establish trust in the learning community. Once trust has been established and a sense of community achieved, instructors may find that online discussions become more rewarding than face-to-face discussions. This was what Jonassen (Jonassen, 2001) found.

Niedzwiezka (Niedzwiezka, 2003) is of the opinion that personality characteristics influence choices (a fundamental assertion in information behaviour). While I agree with that I have my doubts about whether this is true of learners of the age of those who were participants. It is possible that particular traits have not yet been set in learners in this early stage of life. If this is so it is not surprising that no particular personality type was found to be predominant in the research (Finding 17). Although Ellis (Ellis, 2003) found that Introvert-type learners are more willing to contribute in discussion forums, it is in my opinion difficult to isolate personality characteristics even though a number of studies reported positive effects when they took perceptual modalities such as learning styles into account (Ghaoui, 2004). I have to agree with with Jelfs (Jelfs, 2002) and in particular with Mayer (Mayer, 2005) who has been involved in research in educational psychology for two decades when he concludes that at the present

moment, learning styles research has not yet produced any noteworthy results. Like Mayer, I also found no positive indication in my research that learning styles made any difference.

Gender differences only produced relevant results in communication patterns in this study. Female learners chatted to a far greater extent (approximately 50% more) than their male counterparts (Finding 28). In the literature, gender differences are already detectable in the different kinds of games that boys and girls built (Kafai, 1996) and in their manner of searching the web (Roy, 2003).

Motivation in children is increased when they are allowed to develop their own learning environments (Kafai, 1996). Attention and motivation should be deciding factors in the design of intrinsically interesting learning environments for children (Malone, 1987).

I agree with Murnane that the successful facilitation of discourse requires hard work (Murnane, 2003) and with Wiggings when he writes that teachers feel that their hard work goes unnoticed (Wiggings, 1993). This is clearly illustrated in the pattern of study activities among learners and teachers in this studies. In the first year of implementation (2004), activity patterns were similar to those of conventional school learners. But in 2005 these patterns changed to a pattern of more activity in the afternoons and evenings (finding 18). Subject advisers worked mostly in the mornings in the first year of implementation (2004) but then changed to working mostly in the evenings in the second year (2005) (finding 19). While the online activity of learners and subject advisers followed an asynchronous pattern with learners either being active in the mornings or afternoons, subject advisers were most active in the evenings (finding 20). This shows the extent to which the increased workload of part-time teachers forced

them to use their evening time to sustain the learning community. If one adds to this the fact that the average class size in this study was around 60 learners per class and the ratio of learners per subject adviser was 223 to 1 (finding 22), one can understand Fisher when he says that group size should be limited and an emphasis should be placed upon facilitation rather than control (Fisher, 2002). Pallof (Palloff, 1999) recommends that class sizes be limited to no more than 20 to 30 even though Jung (Jung, 2000) has found that class sizes are as high as 1100 are still manageable. When I take all these factors into account, I agree with Galusha when he writes that the inadequate interaction and feedback are common problems in eLearning resources (Galusha, 1997).

Communication

I agree with Scardamalia (Scardamalia, 2004) and Heydenrych (Heydenrych, 2001) that the communicative capacity of eLearning resource is supremely important, and with Anderson when he says that facilitating discourse is a key task of the facilitator (Anderson, 2004c). One may expect to see a developing maturity in the quality of discourse among learners using an eLearning resource over a period of time.

Learners did not utilise the communication potential of the elearning resource to the full.

In view of the supreme importance of communication, it is surprising to note that less than half the learners claimed to have adequately exploited the possibilities for communication inherent in the eLearning resource (Research finding 23). The implication of this is that the communication features of the eLearning resource were not used to the full by the participating learners. It is possible that the learners needed more time to become accustomed to the interface or that they needed more time to develop the art of sophisticated discussion, which is what Graddy found (Graddy, 2003). It is also quite possible

that learners simply do not actually need more interaction and communication than they are already getting.

Other researchers have also identified levels of zero usage on the part of learners. Hughes, for instance, found that some learners do not develop real discussions, no matter what the input from their teachers (Hughes, 2002). Ferdig (Ferdig, 2003-2004) replicated Hughes's finding and added that learners do not automatically take to discussions and communication just because the tools for them are there. It is clear that one should not rely too much on learner initiative in this matter. If the exploitation of the possibilities of eLearning is left to the learners themselves, then, as Ng (Ng, 2001) and Hughes (2002) have found, learners may never actually get round to investigating the elearning resource's potential. On the other hand, Sorensen's finding, which I think deserves careful consideration, is that when students are forced to participate in discussion forums, a great deal of unneeded communications are generated (Sorensen, 2002). And when too many new topics are introduced into a communication forum, attention becomes scattered and is diverted away from really important online discussion topics (Hewitt, 2003).

It is my opinion that communication should arise out of an intrinsic motivation and need to participate. Tu, for example, found that where there is a strong feeling of community in an online course, one may expect to see increased levels of interaction (Tu, 2002). If what Collins (Collins, 2004) says is true, namely that the level of online writing is an indicator of success in an online course, then many online courses may be judged to be failures. If the only online components that made a difference in learning were lesson notes, the online calendar, quizzes and tests, as Sain reports (Sain, 2003), then I strongly agree with Le Blanc that eLearning desperately needs an infusion of new ideas to give life to threaded

discussions (Le Blanc, 2004). I also agree with Brett that because patterns of engagement seem to be persistent, it is necessary to intervene earlier rather than later when promoting desirable features (Brett, 2004).

One of the unique features of online discussions has been seen to function to its advantage. Thus, for instance, the time lapse that is a feature of online discussions gives discussions of this kind a unique character and leads to important changes in communication patterns (Hudson, 2000). It is also important to take into account the fact that text-based discussion has its own specific dialect and colloquialisms (Fisher, 2002) that are more closely related to the styles of youth culture than is formal academic writing. Emoticons, for example, need to be used wherever possible (Fisher, 2002). Online communication couched in a semi-colloquial conversational style has been found to be more effective than formal text (Mayer, 2004).

There are number of ways in which online communication can be made more effective. These include:

- Online teachers should include scaffolding aids in their online discussions (Land, 2001-2002).
- Social and communication cues should be built into the system because a lack of social and communication cues may lead to online conflict (Zafeiriou, 2003).
- Media-rich messaging may compensate for the lack of visual clues in online discussions (Bellamy, 1998).
- Because of the lack of non-verbal clues, specific attention must be given to problems of expression in online environments (Fisher, 2002).
- Online tutors should take advantage of research that shows that there is an optimal way to prompt student discussion and it is that the controller

should summarise a few postings and then ask a question (Haavind, 2000). Feedback also plays a critical role in dialogue between online tutors and learners (Hyland, 2001).

The substance of learner communications

Analysis showed that only about one third of the discussions was about academic-related matters and that the remaining two thirds were devoted to socialising (Research finding 29). While this tends to prove how individualistic learners are in pursuing their own ends (research finding 10), it also shows the great need that online learners have for socialising. The learners in this research used the communication facilities of the eLearning resource to pursue their own academic and social needs, with social needs having a strong edge over academic needs, which is exactly what Pena-Shaff (Pena-Shaff, 2001) found. The learners who used the chat rooms to socialize (Research finding 27) were predominantly female (50% more than males, finding 28), and text traffic was largely social rather than academic (Research finding 29). Im (Im, 2003-2004) also found that female learners dominated discussions and these discussions were also mostly social in nature. The gender spread in terms of academic discussion participation was about equal (50%-50 (Research finding 30).

Active and isolated learners and the phenomenon of lurking

Approximately half of the learners were active contributors and half were isolated learners who contributed almost nothing (Research finding 32). Only about one third of the learners added a photograph of themselves or a symbolic image (icon) that represented themselves to their profiles (Research finding 42). While the percentage of learners who “lurked” was about 40% initially, this percentage decreased to around 25% during the two-year period (Research finding 33). This suggests that if lurkers are given more time to become

accustomed to the facilities, some of them do eventually venture out to communicate.

Preece (Preece, 2004) also found that lurking is an ever-present phenomenon in eLearning. He states top five reasons for lurking are:

- Lurkers felt no need to respond.
- Lurkers were inhibited by the fact that they did not know the group.
- Lurkers obtained the help they needed without resorting to postings.
- Lurkers were prevented from communicating by software problems.
- Lurkers very often disliked the group so much that they referred to lurk.

Wenger (Wenger, 2004) suggests that small but active core groups within larger groups might well solve the problem. But Scardamalia (Scardamalia, 2004) shows that lurkers feel more comfortable with asking questions online because discussion forums allow them to ask questions that (for whatever reason) they would not or could not ask in class. Spears (Spears, 2001) also found that the Internet lowered inhibitions among those that participated and that this may be an advantage in some circumstances.

Modes of communication and preferences

Although most learners preferred to be contacted by means of an email for academic purposes, I believe, along with Farmer (Farmer, 2004), that the use of mobile telephones for communication will increase dramatically in the future.

Technological considerations

There are a number of findings from the research that may be valuable in the implementation of new eLearning resources. They may be summarised as follows:

- The average size of a file of course material was 72 kilobytes. It took 5,5 hours to upload 1.1 gigabytes of data in 16 000 lessons in South Africa in 2005 (finding 37).
- Hack attacks and viruses can waste large amounts of bandwidth and increase running costs (finding 38).
- The automated course creation of the 74 courses saved approximately 1300 hours of human labour and around US\$11 000 in South Africa in 2005 (finding 39).
- Course development costs in the researched institution were significantly cheaper than they would have been if they had been developed outside South Africa. Thus, while course development for one course cost US\$3 000 in South Africa, it would have cost US\$88 000 in the United States (finding 40).
- Because it is necessary constantly to upgrade and maintain an elearning resource such as that used in the research, it is necessary to have the reliable and appropriate technical experts on hand to perform these operations continuously (finding 35).
- Web servers inside the local country usually offer better speeds (finding 36).

eLearning resources tend to have a common toolset. Leslie's (Leslie, 2003) synopsis of the findings of the Edutools.info project summarises the most important characteristics common to the 45 course management systems that he evaluated. The top 15 important characteristics of these researched resources occur in the eLearning resource used in this study.

In the following table the intellectual puzzle for this study is presented, together with findings in the literature review, the findings of this research, links to the



data, as well as implications for the resource.

The intellectual puzzle for this study together with findings, links to data, and implications

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

Research Objectives	Subsidiary Questions	Findings in Lit review	Findings in this research	Source	Implications for the eLearning resource
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?	<p>eLearning models are constantly emerging. Several were discussed. Community is prominent in all these models.</p> <p>eLearning must build on pedagogical learning theories. The merging of behavioural and constructive theories is advisable.</p> <p>The Hexa-C Meta model and Companionship provide a neat summary. They include cognitive science, constructivism, component-based instruction, customisation, creativity and</p>	<p>1 Overall academic performance was good.</p> <p>2 Cognitive science theory elements are supported by the eLearning resource.</p> <p>3 Constructivist learning theory elements play a crucial role in the eLearning resource.</p> <p>4 The learners expressed themselves as being quite certain that the eLearning system was workable and desirable in terms of Component Display Theory elements.</p> <p>5 While customization was regarded as important, the eLearning resource only permitted a limited amount of customization.</p> <p>6 The eLearning resource made allowance for personal creativity and provided an environment that challenged learners to develop and nurture their own motivation. This feature of the resource suited those learners who were more independent and mature than the average.</p> <p>7 While learners appreciated the value of collaboration, they preferred to work alone rather than together.</p> <p>8 Companionship (i.e. contact with other human beings) is the most important element in the eLearning resource.</p>	Questionnaire questions on pedagogical issues. But because they were only high school learners, I am not sure that they always understood the questions correctly. Nevertheless, the results show that in their opinion the resource did help them to learn. The focus groups confirm this.	<p>There are many suggestions from the Lit. Review for improvement so that the resource becomes more social constructionist.</p> <p>The wording used for high school learners must be simpler than that used for tertiary students.</p>

Research Objectives	Subsidiary Questions	Findings in Lit review	Findings in this research	Source	Implications for the eLearning resource
<p>Find out to what extent the eLearning resource facilitated the creation and maintenance of an eLearning community.</p>	<p>Question 2 Why do certain community elements in an eLearning resource contribute to creating and sustaining high school learning?</p>	<p>collaboration. Companionship is an additional important component.</p> <p>A taxonomy of an eLearning community is presented and summarised in seven main themes. These themes are active interaction, collaboration from an independent base, lively discourse and discussions, a sense of community, information sharing, real quality learning and an attitude of open involvement.</p> <p>The role of the online instructors appear to be paramount.</p> <p>The personality and character of individual users affect a learning community.</p>	<p>9 Learners experienced an increased sense of community between the first year and the second year.</p> <p>10 These learners are strongly individualistic.</p> <p>11 Peer pressure plays no significant part in the lives of these learners.</p> <p>12 Learners do not prefer working in groups to working alone.</p> <p>13 Learners do not like competition.</p> <p>14 The learning community creates a feeling of safety, care and openness.</p> <p>15 This type of community makes it possible for learners to have a wider range of friends.</p> <p>16 Face-to-face meetings enhance a sense of community and serve to bind the community together.</p> <p>17 Personality types are more or less balanced and no particular trait dominates. The “Thinking” (71%) and “Perceiving” (68%) traits are the only ones indicated by around two thirds of the learners.</p> <p>18 While the pattern of study activity among learners was similar to patterns found in a conventional school in 2004 (the first year of implementation), this changed in 2005 to a pattern of more activity in the afternoons and evenings.</p>	<p>Various questions in questionnaires, focus groups.</p>	<p>It must have an interface that can be customized.</p> <p>Groupwork activities should be avoided</p> <p>It must have a personal page where preferences can be set. Learners must be able to choose whether to be anonymous or not. If possible, it must accommodate different learning styles by incorporating different modes.</p> <p>It must accommodate synchronous and asynchronous</p>

			<p>19 While subject advisers worked mostly in the mornings in the first year of implementation (2004), this changed to a pattern of working mostly in the evenings in the second year (2005).</p> <p>20 The online activity of learners and subject advisers follows an asynchronous pattern with the learners being active either in the mornings or afternoons,. But subject advisers are active mostly in the evenings.</p> <p>21 The average class size was 57 with 62 learners per class in 2004 and 2005 respectively.</p>		communication
<p>3 Find out to what extent the eLearning resource enabled students to communicative and collaborate.</p>	<p>Question 3 In what way and why do certain communication, collaboration and social elements influence a high school eLearning resource?</p>	<p>Literature on communication is extensive.</p> <p>Various positive and negative pointers were grouped in the literature review.</p>	<p>22 The ratio of learners to subject adviser was 223 to 1.</p> <p>23 Fewer than half the learners said that they had adequately exploited the possibilities for communication inherent in the eLearning resource.</p> <p>24 Learners mainly preferred to be contacted by means of email for academic purposes. The smaller number preferred to be contacted on a conventional (landline) telephone, and an increasing number preferred to be contacted on their mobile telephones.</p> <p>25 While 83% of learners owned mobile telephones, only 56% could be reached by means of an SMS – despite the fact that approximately 80% agreed that their numbers had not changed.</p> <p>26 Almost all emails (92-94%) were successfully mailed. But this high delivery rate does not mean that the emails were read.</p> <p>27 Learners used chat rooms mostly to</p>	<p>Questionnaires focus groups</p>	<p>From Lit review Interface should accommodate discussion flow, and if it is already there, ways must be implemented to use it.</p> <p>Ingenious ways to improve communication should be researched and developed</p>

			<p>socialize.</p> <p>28 Female learners chatted to a far greater extent than did their male counterparts (approximately 50% more). Averages: Female chat volume was 73% in 2004 and 63% in 2005 – as opposed to male chat volume which was 27% in 2004 and 37% in 2005.</p> <p>29 Analysis showed that only about one third of the discussions concerned academic matters (1008 out of 2741 = 37% in 2005).</p> <p>30 The gender spread in terms of academic discussion participation is about equal (50%-50%). This is different from the pattern of chat activity where female learners contributed most of the traffic volume.</p> <p>31 On average, learners contributed 174 chat posts per year, approximately 14 forum posts per year, and about nine forum replies per year.</p> <p>32 Approximately half of the learners were active contributors and half were “isolated” learners who did not actively contribute.</p> <p>33 While the percentage of learners who “lurked” was about 40% initially, this percentage decreased in the two-year period (42% in 2004 became 32% in 2005)</p>		
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Research Objectives	Subsidiary Questions	Findings in Lit review	Findings in this research	Source	Implications for the eLearning resource
Find out what technological constraints 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 eLearning resource?	<p>The open source program, Moodle, provides a cost effective, stable and fully functional eLearning platform that contains most of the features found in expensive commercial programs. Since the emphasis of Moodle is on social constructivist pedagogics, it proved to be extremely supportive of this research.</p> <p>Hosting a service with an appropriate hosting service is critical to the speed and functionality of the resource.</p> <p>The limited capacity of the human working memory circumscribes the way in which content can be presented in an eLearning environment.</p>	<p>34 Both learners and subject advisers were highly computer-literate and displayed positive attitudes towards both the medium itself and to the eLearning resource.</p> <p>35 Because constant updating is necessary, it is necessary to keep reliable technical experts on hand continuously to upgrade the resource.</p> <p>36 Web servers inside the local country usually provide better speeds.</p> <p>37 The average size of a file of course material was 72 kilobytes. It took 5,5 hours to upload 1.1 gigabytes of data in 16 000 lessons in South Africa in 2005.</p> <p>38 Hack attacks and viruses can waste large amounts of bandwidth and increase running costs.</p> <p>39 Automated course creation of 74 courses saved approximately 1300 hours of human labour and around US\$11 000 in South Africa in 2005.</p> <p>40 Course development costs in the researched institution were significantly cheaper than they would have been if they had been developed abroad. The costs involved were US\$3000 in South Africa as opposed to US\$88000 in the United States.</p>	Various questions in questionnaires and focus group interviews with both staff and students	<p>Bandwidth usage is generated with more and more features. The cost effectiveness of every implemented feature should be carefully considered. Each implemented feature should be justified on the basis of what whether or not it makes an important difference and what it achieves.</p> <p>Expertise is needed to setup and maintain a cost-effective system.</p> <p>eLearning in South Africa is not a cheap option..</p>

		<p>Merrill suggests five principles that are common to effective instruction: being engaged in real-world problems, activating previous experiences, demonstrating what is to be learned, and applying new skills.</p> <p>The main challenge for eLearning lies in getting instructional design right. Effective design takes into account working with problems, the use of realistic materials, the identification of good information resources and cognitive tools, and the need for conversational and collaboration tools and social support.</p>	<p>41 It is necessary to set certain minimum hardware requirements for those who enrol.</p> <p>42 Only about one third of the learners added a photograph of themselves or a symbolic image ("icon") to their profiles.</p>		
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Table 66 : The intellectual puzzle for this study together with findings, links to data, and implications

This table shows the intellectual puzzle for this study together with findings, links to data, and implications

5.4.3. Scientific reflection

The scientific reflection focuses on what this research has contributed to the scientific body of knowledge in this field.

I have extracted the most important findings from this research and have presented them in the table below.

Findings in this research	Research sub-question 1 (Pedagogics)
7	While learners appreciated the value of collaboration, they preferred to work alone rather than together.
8	Companionship (i.e. other human beings) is the most important element in the eLearning resource.
Research Sub-question 2 (Community)	
9	Learners experienced an increased sense of community between the first year and the second year.
10	The learners have strong individualistic inclinations.
11	Peer pressure does not play a role in the lives of these learners.
12	Learners do not prefer group work.
13	Learners do not like competition.
14	The learning community creates a feeling of safety, care and openness.
15	This type of community makes it possible for learners to have a wider range of friends.
16	Face-to-face meetings enhance a sense of community and serve to bind the community together.
18	The pattern of study activity among learners followed was similar to patterns found in a normal school in 2004 (the first year of implementation), but changed in 2005 to a pattern of more activity in the afternoons and evenings.
19	Subject advisers worked mostly in the mornings in the first year of implementation (2004) but then changed to working mostly in the evenings in the second year (2005).
20	The online activity of learners and subject advisers follows an asynchronous pattern, with the learners either being active in the mornings or afternoons, while subject advisers are most active in the evenings.
21	The average class size was 57 and 62 learners per class in 2004 and 2005 respectively.
22	The ratio of learners per subject adviser was 223 to 1.
Research Sub-question 3 (Communication-Collaboration)	
23	Less than half the learners said that they adequately exploited the possibilities for communication inherent in the eLearning resource.
27	Learners used chat rooms mostly to socialize.
28	Female learners chatted to a far greater extent than did their male counterparts (approximately 50% more). Averages: Female chat volume was 73% in 2004 and 63% in 2005 – as opposed to male chat volume which was 27% in 2004 and 37% in 2005.

29	Analysis showed that only about one third of the discussions were about academic-related matters (1008 out of 2741 = 37% in 2005).
30	The gender spread in terms of academic discussion participation is about equal (50%-50%) - dissimilar to chat activity where female learners contributed most of the traffic volume.
33	The percentage of learners who “lurked” was about 40% initially, but this percentage decreased in the two-year period (42% in 2004 became 32% in 2005)
	Research Sub-question 4 (Technological)
34	Both learners and subject advisers were highly computer-literate and displayed positive attitudes towards both the medium itself and the eLearning resource.
36	Web servers inside the local country usually provide better speeds.
37	The average size of a file of course material was 72 kilobytes. It took 5,5 hours to upload 1.1 gigabytes of data in 16 000 lessons in South Africa in 2005.
39	Automated course creation of 74 courses saved approximately 1300 hours of human labour and around US\$11 000 in South Africa in 2005.
40	Course development costs in the researched institution were significantly cheaper than international costs – US\$3 000 in South Africa as opposed to US\$88 000 in the United States.

Table 67: Summary of Research findings

The table shows the research findings for this research

Recapitulation: the highlights and main findings of the research

This research shows that it is possible for a group of high school learners to co-create and experience an online learning community by using an eLearning resource that is similar in its functions to ones that have been designed for older students in a university setting. The standard features that are currently being used in this eLearning resource are both workable and desirable.

The proper engagement and involvement of companions is absolutely necessary if one hopes to facilitate a learning community by using an eLearning resource. Parents and teachers are the most obvious companions. The features of an eLearning resource that support interaction between companions and learners are desirable. The actual features of the eLearning resource are currently being underutilised. All current features may be regarded as workable.

What is immediately apparent about the composition of this group is their independence, their strong individualism and their aversion to group work and

competition. One could reinforce these characteristics in e-learners by designing the elearning resource in such a way that it makes special provision for these characteristics and so becomes even more desirable. Unless group work is absolutely necessary for academic success of learners, it should be avoided because it appears to annoy learners such as those who participated in this research.

The eLearning resource permits learners to create (“customise”) a lifestyle for themselves that suits their needs. In the second year of implementation, more learner activity was detected in the afternoons and evenings. Teachers also changed their pattern of working hours during the same period so that they worked more in the evenings. There was a definite asynchronous pattern of interaction between students and teachers during the period of the research. Teachers who teach these learners have to cope with bigger class sizes and a higher ratio of learners to teachers than one would find in a conventional school. Teachers would be deeply appreciative of any resource features that would ease their workload.

Economies of scale can be achieved in practice by permitting teacher to learner ratios that would not be workable in a conventional school environment but that seem to function reasonably well in an online environment.

The communication facilities in this eLearning resource were underutilised for academic purposes. Most of the chatting related to the social interests of the students while only one third of discussions were concerned with academic matters. More than one third of the learners were “lurkers” – silent online observers and listeners who made no contributions at all. This tendency might be explained by the fierce individualism of the students in this research who had

a strong preference for working alone rather than in groups such as chat rooms. It is possible that such students preferred to solve their own academic problems without reference to their fellow students. It is apparent that teachers also do not spend enough time in preparing collaborative tasks. Enhancements of communication facilities will presumably always be a priority for those who want to create more desirable features in an eLearning resource.

Both the learners and the subject advisors were sufficiently technically skilled to find their way around the resource and both groups were highly computer literate. The enthusiasm of both the learners and teachers for this online medium of instruction and their ability to manipulate it effectively contributed largely to the establishment and success of this online eLearning community. It was critical to have the eLearning resource supported by a knowledgeable team with good programming skills. Downtime was almost zero during the two years of the research. One can therefore say that both the computer and network hardware were able to perform the tasks required of them adequately and efficiently. In spite of the ever-present threat of hackers and distributors of viruses in cyberspace, the eLearning system was only brought down for two days because of a worldwide denial of service attack by organised international hackers.

5.5. Recommendations:

5.5.1. For policy & practice

The following is recommended.

Strategic

In making decisions and taking actions that will determine the long-run performance of an eLearning resource for learners of schoolgoing age, recommends that the policies on which to base an eLearning strategy should

always be founded on the pedagogical theories and models accumulated by mankind thus far.

This study reiterates the importance of the role of companions in the success of any eLearning endeavour for schoolgoing learners. In a medium-, long term strategy for an eLearning resource for learners of schoolgoing age, the human support structure, including parents, teachers, mentors etc cannot be overemphasized.

Tactical

In planning and maneuvering to operate an eLearning resource, one should get a clear picture of the make-up of the participants. For instance, in this research, the learners reported that they are independent learners, and that they do not prefer group work. The eLearning implementation should then work with the learners and not enforce many group activities.

Operational (functional)

On a functional level, operating an eLearning resource for high school learners, synchronous and asynchronous demands must be met. This study showed a very definite asynchronous activity pattern between teachers and learners. Thus, expectations about response and feedback should be managed. For example : learners should know that their teachers will probably only answer their posts in the evenings.

At high school level, one should expect that most communication from learners will have a “social” nature. A very high level of seemingly “useless” data needs to be managed.

A technical team, with programming capability, with very specific expert internet and network knowledge is to be employed or outsourced. In “cyberspace” an eLearning can easily be taken of air or be constantly paralyzed by malicious acts. The technical team must be on constant alert for areas that needs attention, ie, adding or removing certain features to improve the learning experience or making support easier for the teachers. The technical team should also manage high volume data created by interaction and do load-balancing between computer hardware so as to always allow the users to experience a responsive resource. A slow resource is bound to discourage the use of such a resource.

5.5.2. Recommendations for further research

Fundamental research

Even though eLearning appears to be acquiring the status and dignity of a science in its own right, it can never divorce itself from being an activity that is central to progressive modern education. Because of this, it will always have to take account of the accumulated knowledge and research that has been conducted over the years in the various fields of learning theory.

I have presented some of the findings about the operation of the Hexa-C Metamodel (Cognitive science, Constructivism, Component Display Theory, Customization, Creativity, Collaboration), together with the important element of Companionship. In spite of the research that has already been done, a great deal more still needs to be done to refine the theory of eLearning – specifically eLearning as it applies to school-going learners.

Applied research

Because of the centrality of community in eLearning, the communication tools of

an eLearning resource are critically important for the success of an eLearning resource. Much more research into the use, design and functionality of communication tools needs to be undertaken if communication models are to be improved. (This recommendation is dealt at more length in the next section.)

The critical role that companions (parents, teachers, mentors) play in the success of high school eLearners also needs much more research.

5.5.3. Recommendations for further development work

Communication tools also need to be developed, refined and made more sophisticated before the overall quality of eLearning resources can be made more desirable and workable. There is an urgent need for innovation to be applied in the development of interactional tools so that they will be more serviceable, workable and desirable in eLearning resources.

Because of the importance of mobile phones in the lives of high school learners, it might be a workable and desirable innovation to link the use of mobile telephonic devices to eLearning resources.

The ability to customize a personal page with academic and personal elements would also make an eLearning resources far more desirable and alluring to the high school users of such resources.

Since such vast quantities of information are available to users, sophisticated tools to manage information would also make an eLearning resource far more workable and desirable.

The potential of the personal computer and the Internet to assist learners and co-participate as an intelligent agent in all stages of learning process is especially underutilized.

There are, for example, a large number of creative precedents for desirable and workable interpersonal features that are already well established on various websites such as Facebook, MySpace, Flickr, Second Life and YouTube (to name but a few). Any number of these features might easily be adapted to enrich eLearning resources without any breach of copyright. If the websites mentioned above are anything to go by, then the tools that learners have to present themselves socially and academically to other eLearners on the resource are woefully inadequate and unappetising by comparison.

The more effective, creative and challenging the tools for social and academic self-presentation are, the richer, more memorable and more affirming will be the experience that learners have in online education. In fact, many learners who are designated as “lurkers” or as “shy” participants may simply be bored by the feebleness of the customisable tools and resource-linked opportunities for imaginative self-presentation available in many eLearning resources. It will be as well for developers of eLearning resources remember that whatever design features they incorporate, these will automatically be competing with the large number of entertaining social websites with which the majority of learners are already familiar.

Unless an eLearning resource is able to make a strong appeal to the imagination and creativity of learners, it will be in all likelihood be *tolerated* rather than *enjoyed*. A great deal of developmental work still needs to be done on the interface between entertainment and learning and on how to make learning

more alluring, challenging and exciting in a world already saturated with high-class online entertainment and socialising software. One of the greatest challenges of eLearning resource developers in the 21st century is how to make learning at least *to some degree* as interesting and challenging as entertainment software. So long as tools for self-presentation by learners in an elearning resource remain uninspiring and unimaginative, learners will only take what they can from the resource and find their entertainment and socialising elsewhere.

One needs to be cautious about condemning socialising on the grounds that it excludes more serious academic matters. Socialising may well be a necessary prelude to serious academic interaction in an online eLearning resource. If that is the case, then an eLearning resource can only be enriched by providing more imaginative tools for social self-presentation by users of eLearning resources. Academic engagement may paradoxically depend on the ability of learners to feel *that they actually matter as individuals* in the cyber world of the online eLearning resource. And one of the ways in which learners are able to feel that they do matter and are important is through imaginative self-presentation. While this happens all the time on highly popular websites such as Flickr and Facebook, there is hardly any scope and all for creative self presentation on the average eLearning resource. This may be a serious defect in current online eLearning resources. Whether it is or not can only be answered by further research into the dynamics of online communication and self-presentation.

It might be instructive in this regard to draw appropriate conclusions from the experiences of Czerniewicz (2001), who experienced participation in an online learning forum as destructive rather than affirming of her personal identity. As one participant in Czerniewicz's course (Czerniewicz, 2001) commented, "When

you have a small group of what are essentially strangers trying to work together without any common sense of association it might provide with a very negative experience.”

I therefore draw the conclusion that unless an online eLearning resource is able to enhance and strengthen the sense of personal identity and uniqueness in participants, it will be experienced as depressing and undermining (which is what happened to Czerniewicz). Since one of the key features of constructivist learning is the construction of personal meaning *in cooperation with other learners*, eLearning resources *need* as many features as possible to strengthen each learner’s sense of personal identity. This is an area that requires urgent research and development.

While modern computer-literate young people are prepared to work hard, it would be unwise to assume that they will always be infinitely intolerant of eLearning resources that are simply conduits for information. Unless high-school learners are given opportunities to constellate a definite self-affirming online cyber *identity* in the context of the eLearning resource, they may well only use the barest features of the resource and reject other opportunities for personal online engagement with their co-learners. While they may then be regarded as lurkers or “shy”, they may merely be bored and uninspired by the resource’s potential.

It is important for all designers of online learning resources to be familiar with the most popular features of the kind of websites that I mentioned above. These websites are currently patronised by millions of users because they have the power to entertain, inspire and satisfy participants and because they appeal to the imagination and social instincts of their users. Like it or not, eLearning

resources are constantly being judged (albeit unconsciously) by the high standards set by most successful pioneers in participatory websites such as those that we have mentioned. It is important for present and future designers of elearning resources to understand why these websites are as popular as they are.

There is currently unlimited scope for those who are passionate about education to apply the lessons that can be learned from the science and engineering of intelligent machines to eLearning resources. Since online learning appears to be the wave of the future in progressive education, it is necessary for designers and developers to incorporate as many successful features of popular websites as might be feasible into the design and development of future eLearning resources. If one considers how the average online resource compares to some of the best popular sites, then it becomes apparent that there are innumerable ways in which eLearning resources can be improved and made more meaningful, exciting, relevant, desirable and workable to high school users..

5.6. Conclusion

It is my belief that the research question “To what extent and why are certain features of an eLearning resource workable and desirable for sustaining a high school learning community?” has been answered in this thesis to such an extent that other stakeholders in high school education will be encouraged to use the information provided to guide them in implementing an eLearning resource that will support a learning community.

Investigations on the subsidiary questions, about pedagogical-, community-, communication- and technological aspects, paint a reasonably comprehensive and descriptive picture, derived from a natural setting, about desirable and



workable features for an eLearning resource for high school learners.

Most functionalities of eLearning resources, as prevalent in the world in 2004/5/6, are desirable and workable in terms of pedagogical-, community-, communication- and technological aspects. Those features that support interaction with companions, teachers or mentors are extremely important in the success of an eLearning resource with learners that are as fiercely independent and individualistic as the subjects in this research. Huge scope for further research and development, and the development of models, exists in almost every feature of existing eLearning resources.

Economies of scale can be achieved, but a competent technical team is essential.

It is my belief that the research has been ethically done and the findings are valid and authentic.

eLearning strategists can benefit from findings in this research.