

**Distributed Communities of Practice:
An Exploration of a Distributed
Community of Practice of South
African Life Science Teachers**

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Abstract

The Biology Teachers Network exhibits all the elements of a distributed Community of Practice. Legitimate peripheral participation, negotiation of meaning through participation and reification of the shared discourse are evident in the sharing of information, collective problem solving and interactions of a high cognitive level. As a result, the levels of professionalism have increased amongst the members, as have the Information and Communication Technology (ICT) skills. The network is dependant on the passionate leadership of a coordinator supported by a core group of members. It is unique as a manually operated, email-based system suited to an environment where the members have low ICT skills but have access to a computer and an Internet connection. The research suggests that this model of distributed CoPs may be a strategy for teacher professional development in South Africa.

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Summary

This study researches phenomenon of the Biology Teachers Network (BTN), a distributed Community of Practice (CoP). The membership of the BTN is voluntary. The BTN is supported by a core group of members and administered by single moderator. The network uses a manually operated email system to communicate and share information as an automatic listserv proved to be beyond the capabilities of the membership.

Etienne Wenger is the authority on the theory of CoPs and provides in depth background to the processes that are evident in a CoP. A CoP consists of the Domain, Practice and Community and through a process of negotiation of meaning, learning takes place through identity formation. CoPs can exist online in the form of distribute CoPs. Passionate leadership is essential for the formation of a CoP as is the voluntary participation of the members.

A Naturalistic case study methodology is considered to be the most appropriate research tool. In this study a focus group interview and a collection of emails were used as data sources. The data was analysed using three instruments derived from the literature.

The conclusion from the analysis of the data was that the BTN is a vibrant and fully functional distributed CoP in the coalescing stage. Participation in the BTN has led to an increase in professional development and ICT skills amongst some of the member teachers. The fact that this was achieved through the use of email instead of sophisticated websites suggests that this model of distributed CoP is suitable for the professional development of teachers in South Africa.

Key Words

Distributed Communities of Practice

Teacher Professional Development

Email

Internet

Knowledge Management

Life Science

Virtual Communities

Negotiation of Meaning

Legitimate Peripheral Participation

Identity Formation

Ethics Clearance Form



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INVESTIGATOR(S)

DEPARTMENT

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M.Ed (Computer Integrated Education)

A case study of an internet mediated community of practice of life science teachers.

Robert McKay - 25351550

Curriculum Studies

21 November 2006

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21 November 2006

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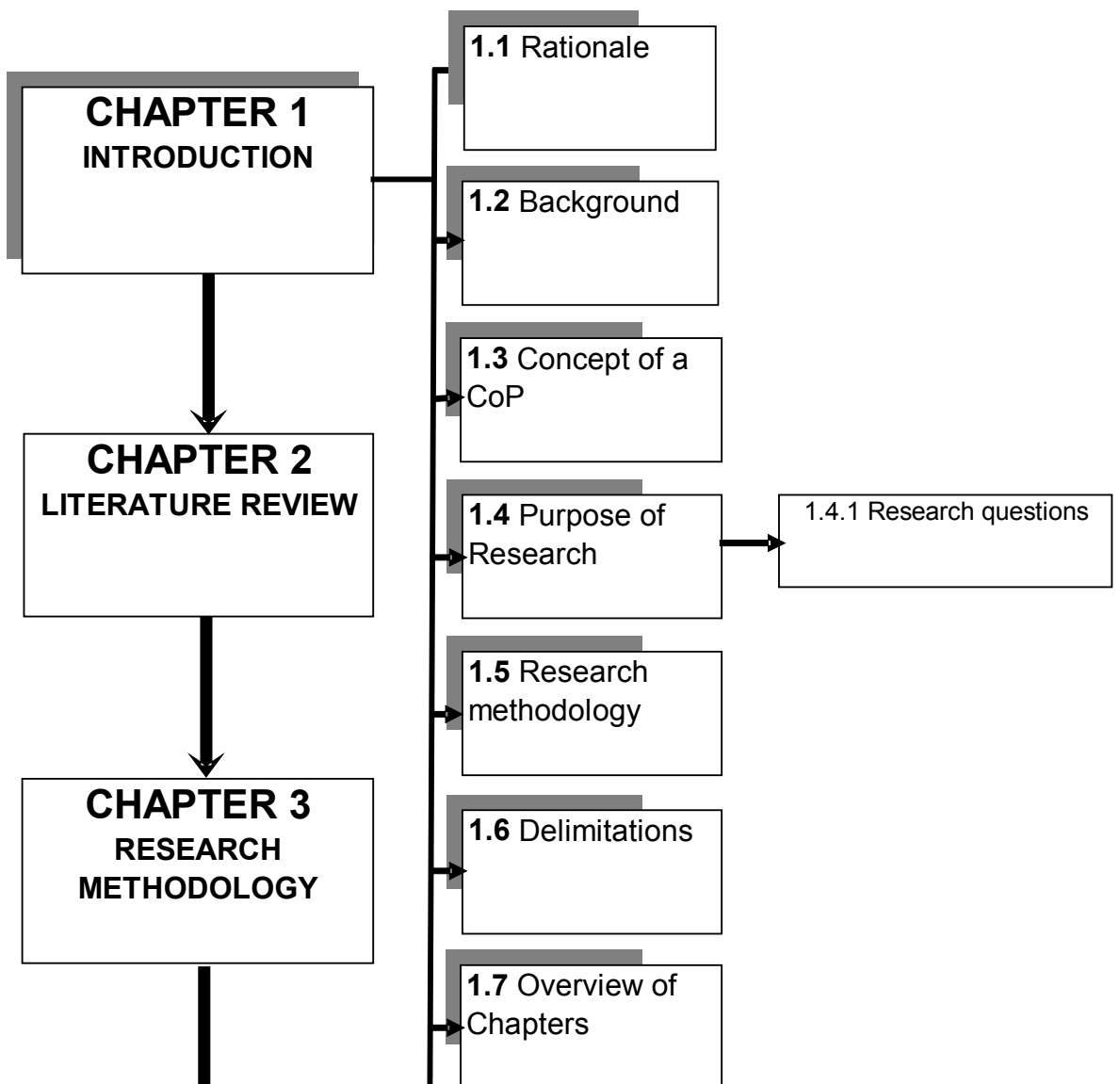
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Chapter 1 Introduction

The purpose of this study is to investigate the phenomenon of a distributed Community of Practice (CoP) known as the Biology Teachers' Network (BTN). The concept of Communities of Practice (CoPs)¹ was originated by Etienne Wenger and Jean Lave. Lave and Wenger originally studied the learning that takes place in an apprenticeship model. From their research they coined the term legitimate peripheral participation and they also introduced the concepts of identity formation and community of practice. The concept of a CoP is applied to many areas of expertise, including education.

With the advent of the Internet the concept of a CoP has expanded to include distributed CoPs. These are CoPs that use the Internet in varying proportions to facilitate their function. Johnson (2001) researched several types of distributed CoPs while Stuckey and Hung provided advice on how to structure and sustain distributed CoPs. The researchers focused on distributed CoPs that used listservs and websites as the main source of Internet support. The unique characteristic of the BTN is that it is a manually operated, email-based distributed CoP.

The BTN membership consists primarily of teachers at secondary schools that administer the Independent Examination Board² (IEB) exam. The fact that the BTN is situated in the South African context suggests that this form of distributed CoP might be better suited to the unique challenges posed by the South African educational context of under resourced schools, low Information and Communication Technology (ICT) skills amongst teachers and large classes.

¹ The acronym CoPs was selected to indicate the plural form, i.e. Communities of Practice, versus the singular form, CoP for Community of Practice.

² The Independent Examination Board administers the grade 12 examinations for many Independent (Private) Schools in South Africa.

This study provides a rich description of the BTN against the backdrop of the broader notion of distributed CoPs. As the Internet becomes more widely available in South Africa, the formation of distributed CoPs will be critical for developing the professionalism of the teaching corp. Through describing the phenomenon of the BTN this research aims to identify factors that can promote the formation and sustainability of distributed CoPs in South Africa.

1.1 Rationale

The knowledge gained from this study will provide concrete advice on how to implement and sustain a distributed CoP. The unique nature of the BTN (manual-based email system) is a model of a distributed CoP that might be successful in the South African context of schools that have few computers, dial up access and staff with limited ICT skills.

The Internet has become a very successful vehicle for the sharing of information. Electronic information is more versatile than hardcopy as it can be altered to suit the context and needs of the user. A distributed CoP such as the BTN has the potential to facilitate professional growth through the sharing of information such as worksheets, tests, images, website addresses (URLs), professional advice and discussion. A distributed CoP provides a link that keeps professionals, in this case Biology educators, in touch with one another.

In the broader context of South Africa this research is necessary as the South African Government White Paper on e-education promotes technology as an approach to boost the performance and professionalism of educators. The paper states that: “e-Education will connect learners and teachers to better information, ideas and one another via effective means of pedagogy and technology” . The Government of South Africa views technology as one of the solutions for improving education in South Africa, and distributed CoPs could provide the support (both emotional and material) for teachers to carry out their jobs more effectively.

1.2 Background

I am the sole Biology teacher at a small independent school that writes the IEB national examinations. At the 2004 national conference of IEB Secondary School Biology Teachers, I proposed that interested colleagues join a Yahoo user group in order to facilitate the sharing of electronic resources. Of the 150 delegates at the conference only six registered. It was apparent that at that time the Yahoo website was unsuitable for information sharing. The alternative route was to use simple and familiar technology.

At the 2005 IEB Biology³ Teachers' conference, I organised the burning of copies of compact discs (CD-ROM) that had electronic versions of the 2003 and 2004 IEB Matriculation Biology exam papers. I also asked delegates to bring electronic versions of their resources to add to the CD-ROM and five people contributed. I recruited members for the Biology Teachers' Network by asking interested teachers to send me an email. Several teachers responded and currently 104 teachers belong to the network.

The BTN functions as a manually operated electronic mailing list. The members send an email to me and I forward it to the group. I have the role of coordinator and facilitator of the BTN. Virtually all the emails are sent out unedited, except for the subject line which always begins with the heading, BTN, followed by a subject description.

³ South African education has undergone significant restructuring and the subject of Biology is now known as the Life Science learning area. The terms are used interchangeably in the study.

1.3 Concept of a CoP

The concept of a CoP was introduced to me in a conversation with a colleague. The concept of CoPs emerged in the 1990's through the seminal work of Etienne Wenger. The theory and practice of CoPs was encapsulated in the book "Communities of Practice" . Etienne Wenger provides a powerful framework for understanding, describing and analysing this form of knowing and learning.

In 1998 the Internet was becoming a vehicle of communication for CoPs and this study uses the term distributed CoPs to portray the phenomena of CoPs that use the Internet.

1.4 Purpose of this study

The Biology Teachers' Network was established in 2004 and has functioned for three years. This should be enough time for a CoP to emerge and accumulate an assortment of experiences, exchanges, representations, jargon, mutual relationships, etc. The purpose of this research is to uncover and describe the phenomenon of the BTN.

The literature review reveals only a few examples of South African distributed CoPs serving secondary school teachers. They are web-based and the emails are sent automatically, not manually as in the BTN. It will be argued that distributed CoPs can contribute to the professional development of teachers in South Africa and that a manually operated (versus and automated) system of emailing can be successful in the South African educational context.

The research questions were designed with this in mind and are discussed in detail in the sub-sections below.

1.4.1 Research questions

The critical research question summarises the focus of interest as:

- What perceived events are observable in the phenomenon known as the Biology Teachers Network?

In order to address the critical research question the problem is further refined into three specific questions that address the affective, cognitive, and psycho-motor aspects of the BTN. The first is:

- What elements of a distributed CoP are evident in the BTN?

To answer the critical research question about the experience of teachers participating in the BTN, the theoretical and practical framework of the BTN is described. The identification of the elements of a distributed CoP is crucial to providing a background for understanding the affective domain i.e. the human experience.

The second specific question relates to professional development and the cognitive domain.

- How does a distributed CoP contribute to professional development of members of the BTN?

The choice of this question was motivated by the fact that the BTN is an information sharing network and as such can lead to the breakdown of isolation experienced by teachers as well as contribute to their professional development. As the coordinator of the BTN I have noticed that the information sharing was contributing to an increase in the skills and professional development of teachers subscribing to the BTN. This question highlights the cognitive domain of the teachers' experience of the BTN.

The third question addresses the psycho-motor aspects of the experience of the teachers participating in the BTN.

- What is the significance of email as a communication medium for the BTN?

Email is the primary means of communication in the information society and is central to the experience of the member teachers of the BTN. Email is also recognised by the South African Education Department as the most common use of ICT at schools that are connected to the Internet. Email is worth examining as the medium for facilitating participation and reification⁴, two vital aspects of a CoP, that lead to the negotiation of meaning or learning through reflective practice.

The research questions clarify the focus of this study as a description of the phenomenon of a distributed CoP of biology teachers employed at IEB secondary schools in South Africa. The affective, cognitive and psycho-motor aspects of the distributed CoP are examined with the aim of improving the practice of the BTN and informing the discourse on distributed CoPs by examining a South African example that uses a manually moderated email list.

1.5 Research methodology

A qualitative case study approach was selected as the methodology is seen to “portray, analyse and interpret the uniqueness of real individuals and situations through accessible accounts”. In order to collect the “accessible accounts” data was gathered from two sources: a focus group interview and an analysis of the email traffic of the BTN from 2004 to 2006.

The focus group interview was recorded using a DVD recorder. An open-ended questioning technique was used based on reflective listening techniques. The interview was then transcribed and manually coded. Email traffic was analysed using a spreadsheet as an organising tool to facilitate memoing and coding.

⁴ Participation, reification and negotiation of meaning are key terms used by Wenger to describe a CoP. They are expanded upon in the Literature Review.

The data from these two sources was 'sieved' through three instruments derived from the literature. The first instrument of analysis was a table of 21 structuring characteristics of a distributed CoP. The second instrument was a checklist of 14 indicators of a functioning CoP and the third a taxonomy that classified emails according to a seven level set of descriptors that measured the cognitive level of reflective practice.

The data was analysed against a backdrop of Grounded Theory and interpreted using the concept of CoPs as a theoretical framework.

1.6 Delimitations

The case study methodology is qualitative by design and every effort was made to ensure the validity of the data and analysis. Researcher bias cannot be completely discounted as the researcher acted in the role of participant observer. The role of participant observer raises the risk of bias but can yield deep insights .

1.7 Overview of chapters

The following Table summarises the content of each chapter.

Table 1: Chapter Summary

Chapter	Title	Summary
1	Introduction	The chapter provides the background and reasons for choosing the topic as well as summarises the data sources, methodology and data analysis.
2	Literature review	The literature review places CoPs in the domain of knowledge management and discusses the theoretical framework of a CoP. Distributed CoPs are discussed with special reference to teacher professional development and distributed CoPs in South Africa.
3	Research methodology	The case study methodology is discussed as well as the methods used to gather and analyse the data. Validity issues are addressed with a focus on Grounded Theory.
4	Findings	The data analysis was completed using three different instruments and yielded evidence to address the research questions. A comprehensive picture of the BTN was constructed and the affective, cognitive and psycho-motor domains are discussed.
5	Conclusion, reflections and recommendations	The analysis of the data is discussed in the context of the critical research question and three specific questions. A set of CoP implementation guidelines was developed from the description of the phenomenon the BTN.

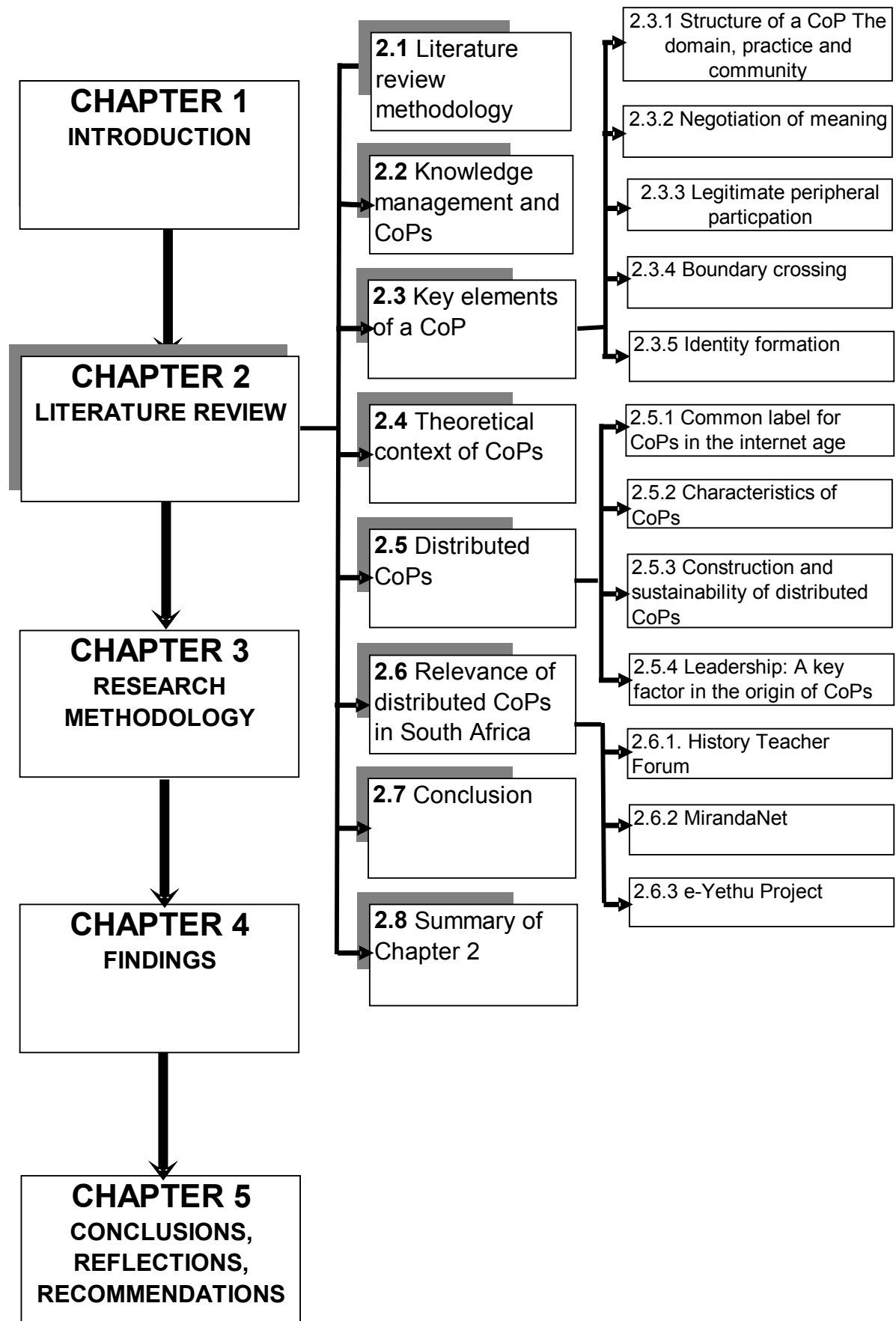
1.8 Conclusion

The BTN is an object of research because it provides a unique example of a distributed CoP of secondary school Biology teachers in South Africa. A case study approach and the associated methods of a focus group interview and the analysis of emails provide rigorous techniques for data gathering. The concept of a CoP provides a useful perspective and suggests tools for a coherent analysis of the phenomenon. The interpretation of the results is underpinned by Grounded Theory.

1.9 Chapter 1 Summary

This chapter provided a rationale, background, delimitations and research questions for the study. It also gave an overview of the methodology and the theme for each chapter.

Chapter 2 is a review of the literature starting with Knowledge Management (KM) and focusing on CoPs and distributed CoPs.



Chapter 2 Literature Review

The aim of this study is to describe the phenomenon of the BTN by looking at the cognitive, affective and psycho-motor domains with respect to CoPs. The specific research questions guided the literature review in order to construct a knowledge base of the theory, practice and research of CoPs.

This chapter describes the methodology of the literature review and then reviews the concept of CoPs from a variety of angles including Knowledge Management (KM), CoPs in general, distributed CoPs and the relevance of CoPs in South African education and teacher professional development.

2.1 Literature review methodology

In order to identify the relevant literature I started using the ERIC database. I used the phrases “Internet Mediated Communities of Practice”, “Virtual Communities of Practice” and “Communities of Practice”. I felt it was important to locate this research in a South African context and I searched for articles using the term “Community of Practice” and “South Africa”. ERIC is a repository for articles of an educational nature and yielded a small number of articles compared to the number retrieved using Google Scholar. I focused on articles discussing CoPs and specifically distributed CoPs with an emphasis on education. Once I had collected several articles in electronic form I copied and pasted the references into a spreadsheet and sorted the data according to author names. Through this process I identified key authors and searched using their names in the author field of Google Scholar. This method yielded several more articles of relevance and led to the sourcing of books related to the research questions.

In order to develop a framework for the research methodology I searched for articles on “Grounded Theory” which yielded useful summaries and discussions. Two useful books provided the guidance on the methods supporting a case study approach .

Another more serendipitous method was to web surf using an open source software package called Stumbleupon.com. Stumbleupon.com currently has over one million members worldwide who have rated websites that they feel are worthwhile. Using Stumbleupon.com I found websites and a thesis, published under the Creative Commons licensure, related to CoPs and distributed CoPs.

I did not include papers on the popular phenomena of online communities, nor did I include articles that described CoPs and distributed CoPs as learning tools for the classroom. The focus of the BTN is a distributed CoP made up of teachers and the topics in this section, while related, are beyond the scope of this study.

2.2 Knowledge management and CoPs

Knowledge Management (KM) is the starting point for the literature review as CoPs are part of a broader theoretical and practice based landscape, not an isolated construct.

CoPs are considered to be one of the components of successful KM. The need to codify knowledge spawned the KM movement. This has led to debate about what knowledge is and how it can be distinguished from information or data. Wilson argues that knowledge is “what I know” and information is “what I am able to convey about what I know”. This dichotomy appears in many forms in the debate, and knowledge is divided into the tacit and explicit or hard and soft . Hard knowledge is that which can be articulated and soft knowledge cannot .

The differentiation between hard and soft knowledge is relevant as CoPs are seen as a possible way to manage soft knowledge. This differentiation led to an important debate regarding the whole purpose and direction of KM. Wilson (2002) predicts the demise of the KM as it is not managing knowledge but information. Hildreth and Kimble (2002) agree that KM is in the business of Information Resource Management (IRM) and is focused on managing structured knowledge. However, Hildreth and Kimble view all knowledge as a duality of hard (explicit) and soft (tacit) knowledge which is in a dynamic balance. Wilson counters that soft knowledge cannot be managed and is elusive, but Hildreth and Kimble suggest that if a less representational and more constructivist view is taken, then so-called soft knowledge

can be managed through the implementation of CoPs. This is because CoPs are “in the best position to codify knowledge, because they can combine its tacit and explicit aspects” .

CoPs are considered, along with knowledge repositories, expertise directories, peer assistance, and best practice replication, as the tools necessary for effective KM .

Knowledge is considered to be living by Wenger and CoPs are able to steward knowledge as the practitioners (community members) create and share the knowledge pertinent to their particular focus. The practitioners know what they know through the social forum of a CoP .

KM is a necessary component of any organisation that deals with knowledge, and schools and teachers are no exception . By implication a CoP is part of the education landscape and is an appropriate theoretical framework against which to evaluate the Biology Teachers’ Network.

2.3 Key elements of a CoP

There are several definitions of CoPs in the literature. A definition that links CoPs to KM is: “Communities of practice are social structures that focus on knowledge and explicitly enable the management of knowledge to be placed in the hands of the practitioners” . To illustrate the range of definitions, this next definition highlights the organic nature of CoP: “Communities of practice are the informal networks of collaboration that naturally grow and coalesce within organizations” . The informal and loose nature of a CoP is partially contradicted by a definition that stresses close social and historic bonds between the members: “Communities of practice are characterized by tight knit groups of people who know each other well. They have been working together for sometime, and are bound together by their shared practice and identity” .

There is a divergent range of definitions because, according to Johnson , most literature quotes Wenger when defining a CoP and his definition of a CoP is broad. Wenger states that “Communities of practice are an integral part of our daily lives. They are so informal and so pervasive they rarely come into explicit focus, but for the same reasons they are quite familiar” .

To bring the concept of CoPs into focus several key elements are clarified, primarily by the works of Wenger, but no less importantly by other authors. These key concepts will be covered here as they provide a language for the phenomenon of a CoP. They are:

- Domain
- Practice
- Community
- Negotiation of Meaning
- Legitimate Peripheral Participation
- Boundary Crossing
- Identity Formation

There are several other elements that underpin the theory of CoP, but these seven inform the aspects of the discourse relevant to this discussion.

2.3.1 Structure of a CoP: the domain, practice and community

A CoP is made up of a Domain, a Practice and a Community. The Domain is the focus, the Practice is the shared repertoire of resources and the Community consists of the members who interact. These simplified and filtered definitions are a wisp of the detail constructed by Wenger in his seminal work 'Communities of Practice, Learning Meaning and Identity'. For example, the concept of a Practice is broken down into several components, viz: practice as meaning, community, learning, boundary, locality and then knowing in practice. Examining the concept of practice as meaning reveals a complex interplay between the concepts of "negotiation of meaning" and the duality of participation and reification.

Fortunately the literature has several articles that elucidate the concepts and in a later work, 'Cultivating Communities of Practice' by Wenger et al. , a more direct and pragmatic approach is followed. Here a Domain is identified as the element that “creates common ground and sense of common identity / affirming its purpose and value to members and other stakeholders”, the Practice is “a set of frameworks, ideas, tools information styles, language, stories and documents that the community members share”, and a Community is that which “creates the social fabric of learning / interactions and relationships built on mutual respect and trust” .

The Domain, Practice and Community are the primary structures of a CoP but the negotiation of meaning is a central process that cements the structure of the CoP.

2.3.2 Negotiation of meaning

The negotiation of meaning is a process of emergent learning through the personal interactions in a CoP. Two processes feed the negotiation of meaning. The first is the process of participation which is the interactions between the members of the community. The second is the process of reification which is the implicit being made explicit. An example of reification is the development of a curriculum or the simple act of writing an email. These two processes are a duality and work together simultaneously. Through this social process a form of learning takes place that would not happen in isolation.

A consequence of negotiation of meaning is the process of legitimate peripheral participation.

2.3.3 Legitimate peripheral participation

Legitimate peripheral participation is the gradual introduction of a novice in a CoP into the mainstream of the CoP through a process of participation rather than a process of reification of a curriculum . Legitimate peripheral participation is a key concept as it explains why it is reasonable for a significant proportion of the members of a CoP to hover on the margins. It also explains the difference between non-participation and marginality which will be scrutinised later in the context of distributed CoPs.

2.3.4 Boundary crossing

The boundary of a CoP (including distributed CoPs) is created through the process of reification and participation and is defined by a discontinuity. In other words, the CoP develops its own mix of characteristics (domain, practice and community) resulting in a unique identity that sets it apart from other CoPs.

There are two connector processes which remove the possibility of total isolation of a CoP. The first process consists of boundary objects or artefacts, e.g. letters, manuals, emails, databases that simultaneously help define the CoP and make connections with other CoPs through mutual use and interaction. The second is a more human element called brokering. Brokers are members of the community that are able to make participative connections that enable new possibilities for meaning and therefore learning .

Boundary crossing ensures that CoPs and distributed CoPs do not exist in isolation and undergo the dynamic interactions that ensure sustainability.

2.3.5 Identity formation

Wenger emphasises identity formation as it clarifies the apparent dichotomy between the individual and the community. The process of negotiation of meaning, fed by the events of participation and reification, results in the life experiences of the members of a CoP becoming an identity.

Hung and Nichani (2002) focus on identity formation to distinguish between quasi-online/distributed CoPs and genuine distributed CoPs. The difference between the two boils down to identity formation as their argument is that many distributed CoPs are no more than a loose group of people sharing information. The process of identity formation cannot take place under this condition and hence the particular social network in question cannot be considered to be a true distributed CoP.

The concept of a CoP was introduced from the perspective of KM and while there are several aspects to the theory of CoPs, seven were highlighted. The Domain, Practice and Community provide enough information for the structural context of a CoP. Negotiation of meaning and legitimate peripheral participation highlight the main processes involved in a CoP and the concept of boundary crossing links CoPs to other CoPs and the outside world. Identity formation removes the apparent dichotomy between CoPs and individualism and focuses on a deeper level i.e. human consciousness . This leads to the next focus of the literature review, the theoretical context of CoPs.

2.4 Theoretical context of CoPs

Wenger describes a complex set of interacting axes in order to locate the Social Learning Theory that underpins CoP. The essence is that people learn from each other when they interact with one another. This fact is supported by the theory of Social Constructivism espoused by Vygotsky .

CoPs are placed in the arena of Social Learning Theory and Wenger locates the theory of CoPs in a level midway between a specific interaction (such as an isolated conversation) and an overarching continuity (such as an entire corporation or even a nation) .

In his 1998 book “Communities of Practice” Wenger hints that the scope of engagement for CoPs, while dependent on specific places and times, could possibly be expanded due to the innovations in technology. He warns that these technological developments are “not simply straightforward expansions of our scope of engagement, rather they involve trade offs”. The result of these trade offs is that “one

kind of complexity replaces another, one kind of limitation is overcome at the cost of introducing another” .

Here Wenger is referring to the Internet and its effect on CoPs. The theory and practice of CoPs includes the notion of distributed CoPs to accommodate the profound impact of the Internet. As the BTN relies almost exclusively on the Internet the concept of distributed CoPs is examined further.

2.5 Distributed CoPs

The authors Hung and Nichani question whether a CoP can exist in an online environment . However, based on an extensive literature review on the topic, Johnson has concluded that online CoPs are viable . Hung and Nichani do not quote Johnson but Wenger et al. add to the debate by noting that CoPs in the online environment are becoming “the standard rather than the exception” and that “collocation is not a necessity” .

Hung and Nichani also question the credentials of distributed or online CoPs and state that several are quasi-online CoPs that share information but are focused on “learning about” rather than “learning to be” (Brown and Dugaid, 2000, p. 128 quoted in Hung & Nichani, 2002). Hung and Nichani suggest several criteria to distinguish a valid CoP from a quasi-CoP. In a valid CoP the members would meet face-to-face as opposed to entirely virtual encounters in a quasi-CoP. The membership is narrower than in a quasi-CoP which results in stronger “reciprocity” manifested as “direct explicit and implicit knowledge flow” .

In a recent definition of a distributed CoP, the focus is removed from the technology and returned to the heart of the matter, the community: “A community of practice is not just a web site, a database, or a collection of best practices. It is a group of people who interact, learn together, build relationships and in the process develop a sense of belonging and mutual commitment” . In order to build relationships and create the sense of belonging and mutual commitment the minimum standard in the literature is that at least the core group of an distributed CoP meet at least once a year .

A CoP can exist in a virtual environment and several labels have been suggested for the phenomenon of a CoP in the Internet age.

2.5.1 Common label for CoPs in the internet age

There are several labels for CoPs that utilise the Internet for communication, support and KM. Several authors, including Wenger, refer to CoPs that use ICT as distributed Communities of Practice . The phenomenon is defined by Stuckey as an Internet Mediated Community of Practice and a Virtual Community of Practice by the authors Dubè, Bourhis and Jacob .

As Wenger is the authority on CoPs his preference for distributed CoPs versus online or virtual is accepted and the term distributed CoP is used in this study. Wenger et al. (2002) justify the use of term, distributed CoPs, as it emphasises “the multiple dimensions of distance to bridge” . The definition is also broad enough to include all forms of ICT including phone and short message services (sms). The terms are used interchangeably in the literature, indicating that there is a shared understanding of the concept of CoPs blending with ICT. The advent of the Internet has spawned a wide range of distributed CoPs and the concept is discussed further.

2.5.2 Characteristics of CoPs

As this study focuses on distributed CoPs the following criteria, while applicable in a broad sense to all CoPs apply to this subgroup of CoPs. Distributed CoPs can be small or big and are structured to deal with their size. They can be long or short-lived, depending on how long the Domain is active. Co-located CoPs are the opposite of distributed CoPs but the key is a shared practice regardless of the form of communication.

The heterogeneous nature of CoPs has its pros and cons, as diversity can bring in different ideas or incapacitating conflict; similarly a homogenous CoP can result in stagnation. CoPs can form spontaneously or with some intervention from an institution which maps onto whether the CoP is unrecognised or recognised by that institution .

The range of distributed CoPs is further refined by Dubé et al. (2006) who identified 21 structuring characteristics of distributed CoPs. The criteria are listed in Table 2 as they provide a current and comprehensive picture of distributed CoPs and expand on the input of the previous paragraph.

Table 2: 21 structuring characteristics of a distributed CoP after Dubé, Bourhis, & Jacob

Broad Categories	Structuring Characteristics	Increasing Levels of Complexity	
Demographics	Orientation	Operational	Strategic
	Life Span	Temporary	Permanent
	Age	Old	Young
	Level of Maturity	Transformational stage	Potential stage
Organisational Context	Creation Process	Spontaneous	Institutional
	Boundary Crossing	Low	High
	Environment	Facilitating	Obstructive
	Organisational slack	High	Low
	Degree of Institutionalised Formalism	Unrecognised	Institutionalised
	Leadership	Clearly assigned	Continuously negotiated
Membership Characteristics	Size	Small	Large
	Geographic Dispersion	Low	High
	Members' Selection Process	Closed	Open
	Members' Enrolment	Voluntary	Compulsory
	Members' Prior Community Experience	Extensive	None
	Membership Stability	Stable	Fluid
	Members' ICT Literacy	High	Low
	Cultural Diversity (same profession, language, vision)	Homogeneous	Heterogeneous
	Topic's relevance to Members	High	Low
Technological Environment	Degree of reliance on ICT	Low	High
	ICT Availability	High Variety	Low Variety

It is beyond the scope of this study to expound on each of these characteristics in detail but suffice to say that this list provides a detailed benchmark for analysing distributed CoPs. Several of the characteristics will be alluded to as they are significant to this study.

The 21 structuring characteristics listed above are a checklist of criteria against which a CoP can be evaluated. However, CoPs do not exist in isolation and it will be shown that they need dynamic interactions in order to be constructed and sustained.

2.5.3 Construction and sustainability of distributed CoPs

There is no shortage of advice on how to construct and sustain distributed CoPs .

Fortunately Stuckey (2004) has produced a work that provides a distilled version of all this advice while avoiding a “one size fits all” prescription. Stuckey herself points out that the advice in the literature “runs the full gamut from fine-grained practical hints and tips to meta-issues expressed at a highly conceptual level” . An example of fine-grained advice is described by Rogers (2000), who developed three concepts from Wenger for use as a framework to evaluate a distributed CoP for e-learning. Rogers suggests “structuring activities so that each learner has the possibility to assume an active and central role. With less experienced members, the teacher may have to help them determine appropriate roles and trajectories” . Rogers not only gives an example of fine-grained advice but provides an example of the linkages between CoPs and education.

Stuckey (2004) summarises the range of advice in a matrix made up of the three columns that cover the non-linear and overlapping processes of design, implement and sustain. The vertical axis of the matrix is made up of rows that cover the areas of social ties, people, common interactions and place or area. Table 3 provides a comprehensive picture of many of the features of a distributed CoP.

Table 3: A summary of a meta-analysis of advice on how to design, implement and sustain a distributed CoP after Stuckey

	Design	Implement	<i>Sustain</i>
Common ties	<p>Situatedness</p> <p>Concentrate on communities that matter</p> <p>Define and articulate your purpose</p>	<p>Reinforce the community's focus</p> <p>Focus on value</p>	<p>Focus on topics important to the business and community members</p>
People	<p>Design for a range of roles</p> <p>Get key thought leaders involved</p> <p>Create executive awareness</p> <p>Make sure people have time and encouragement to participate</p> <p>Collect and use feedback from members</p>	<p>Find a well respected community member to coordinate the community</p> <p>Create meaningful and evolving member profiles, history and context</p> <p>Develop an active and passionate core group</p> <p>Acknowledge the voluntary nature of participation</p>	<p>Harness the power of personal connection</p> <p>Play on all motives for participation</p> <p>Build personal relationships among community members</p> <p>Don't be too strict in judging</p>
Social Interaction	<p>Develop interdependency</p> <p>Create a rhythm</p> <p>Integrate rituals of community life</p> <p>Combine familiarity with excitement</p> <p>Keep it fresh</p>	<p>Invite different levels of participation</p> <p>Create critical mass of functionality</p> <p>Provide the materials that collaboration requires</p> <p>Make it easier to contribute and access</p> <p>Rely on the fun factor</p> <p>Fit the tools to the community</p>	<p>Actively generate content</p> <p>Encourage communication</p> <p>Encourage appropriate etiquette</p> <p>Create dialogue about cutting edge issues</p>
Place or area	<p>Form communities around people, not applications</p> <p>Create forums for thinking together as well as systems for sharing information</p> <p>Design for evolution (flexible, extensible)</p>	<p>Fit the tools to the community</p> <p>Develop both public and private spaces</p> <p>Open a dialogue between inside and outside (brokering)</p>	<p>Facilitate member-run sub-groups</p>

It is not the scope of this study to elucidate each and every item of advice, but the area of leadership needs further examination in the context of Stuckey's work.

2.5.4 Leadership: A key factor in the origin of CoPs

Wenger (2004) states that the origin of a CoP can occur due to the spontaneous initiative of a passionate individual or group or it can be formally constructed through institutional planning and design. Whatever the origins the most successful CoPs are ones that are a combination of bottom-up enthusiasm from the members and top-down support from the institution.

The form of leadership referred to in Table 3 is that of a respected member of the community in the role of coordinator and ideally the involvement of thought leaders and executive support. Wenger (2001) confirms that the formation of a CoP is not guaranteed and that it depends on leadership and voluntary involvement. In a study of distributed CoP of 43 coordinators of Adult Learning Councils, the role of the moderator was deemed "absolutely critical". This is confirmed in a South African study of the potential of the Internet to provide development programmes for improving the training of teachers grappling with the reformed Curriculum 2005. Here the role of the mentor was "highly valued by the participating teachers".

Schlager and Fusco looked at the professional development of teachers and noted that the leadership of a CoP does not necessarily map onto the hierarchical structures of the organisation. The position of leadership in a CoP is not necessarily conferred by a formal process but rather through the process of negotiation. Leadership is therefore a critical element in the formation and sustenance of a distributed CoP.

Apart from the 21 structural characteristics and the criteria defined by Stuckey as necessary to construct and sustain a distributed CoP, Wenger provides a check list of 14 indicators as evidence of the formation of a CoP.

2.5.5 Check list of indicators of a CoP

Wenger lists 14 indicators that are present in a CoP and by implication a distributed CoP. The list is summarised below and it provides another tool against which a CoP can be evaluated.

A check list of fourteen indicators present in a CoP:

- Sustained mutual relationships – harmonious or conflictual
- Shared ways of engaging and doing things together
- Rapid flow of information and the propagation of innovation
- Absence of introductory preambles
- Quick set up of a problem to be discussed
- Substantial overlap in the participants' descriptions of who belongs
- Knowing what others know, what they can do and how they can contribute to an enterprise
- Mutually defining identities
- Ability to assess the appropriateness of actions and products
- Specific tools, representation and other artefacts
- Local lore, shared stories, inside jokes, knowing laughter
- Jargon and shortcuts to communication
- Certain styles recognised as displaying membership
- Shared discourse reflecting a certain perspective on the world

The checklist provides a useful tool for the analysis and evaluation of CoPs. Another dimension of evaluation of CoPs is the notion of relevance, especially in the context of teacher professional development in South Africa.

2.6 Relevance of distributed CoPs in South Africa

A study by Foulds (2005) highlights the question of the relevance of CoPs. The following review of the literature attempts to address the question of relevance of CoPs in South Africa, specifically South African education.

There is considerable research on CoPs in the business world but less focus on learning organisations such as schools . The literature search revealed four studies conducted in South Africa that focused on tertiary and secondary institution based distributed CoPs .

Carr et al (2005) focused on the development of CoPs to enhance the use of ICT and teaching at a South African tertiary institution. Due to the historical and present lack of ICT teaching at South African schools, highlighted by Howie et al (2005), tertiary education students lack the necessary ICT skills. Similarly, the teaching staff of the tertiary institutions lacked ICT skills due to historically low levels of investment in ICT at tertiary institutions. Foulds (2005) highlights the near impossibility of implementing the then Curriculum 2005 through conventional face-to-face workshops and advocates an approach that involves the use of ICT and a form of distributed CoPs. Hodgkinson-Williams & Brandt describe such a model, which includes a distributed CoP, and is elaborated on later in this section.

The litany of problems that beset South African schools are well documented, and one of the responses to this is the professional development of teachers .

Professional development is seen as critical as “teachers who engaged with the larger educational community were more likely to use constructivist and collaborative instructional strategies in their classrooms” . Haycock stressed that good teaching comes from good teachers and that professional development can play a role in promoting teaching excellence.

There are several obstacles to professional development, including reluctance by teachers to engage in discussion with their peers about their own and others work,

the difficulty of building relationships between school departments and, because classroom practice is so personal, the avoidance of reflective practice .

This reluctance to engage and reflect, results in teacher isolation, limiting professional development and teaching excellence. Several authors refer to this phenomena. For example: “The teacher’s isolation in her classroom works against reflection-in-action. She needs to communicate her private puzzles and insights and test them against the views of her peers” . Wenger confirms this obstacle: “a teacher isolated from other practitioners and immersed in classroom issues ceases to be representative of anything else and artefacts gain local meanings that do not point anywhere” (Wenger, 1998, p 115).

The use of distributed CoPs, such as EdNet@UMass, have been suggested as a means of overcoming the isolation of teachers and at the same time providing a more realistic and ongoing form of professional development . Schlager and Fusco state: “Teacher professional development is more than a series of training workshops, institutes, meetings, and in-service days. It is a process of learning how to put knowledge into practice through engagement in practice within a community of practitioners.” This notion extends to distributed CoPs as described by Gray : “Organisations and professional associations are increasingly examining the potential of online networks to enable members to share knowledge and engage in ongoing workplace learning and professional development.”

There is general agreement that distributed CoPs can provide the necessary infrastructure for informal or formal teacher professional development. This is achieved through the free exchange of resources as temporal and geographical barriers are eliminated. Newcomers are less threatened by the environment of a distributed CoP as there is a degree of anonymity.

Wenger (1998) does caution that CoPs should not be romanticised. A point expanded upon by Hung and Nichani (2002) who list the drawbacks of a distributed CoP as the loss of social nuance, low levels of trust and lack of opportunity for serendipitous exchanges due to the brief interaction times and lack of face-to-face contact.

These reservations are well founded and the following three examples of distributed CoPs, dedicated to educational professionals, highlight the above mentioned pitfalls as well as illustrate the potential success of a distributed CoP dedicated to the teaching profession.

2.6.1 History Teacher Forum

This moderated online forum in the United Kingdom has over 700 members (mainly secondary school history teachers) but only 50 participate on a regular basis. In order to prompt discussion provocative postings are posted. Considering that this group is homogenous and shares a very clear domain it should have all of the characteristics of a distributed CoP, yet it falls short especially in terms of participation.

Participation is considered to be part of the duality with reification that results in the negotiation of meaning in order for the primary function of a CoP to take place viz. learning in a social context. Non-participation can be construed as legitimate peripheral participation whereby participants “lurk” and participate passively. The natural progression of legitimate peripheral participation is that over time the member “lurker” will develop the confidence to follow an inbound trajectory towards the core group and become a more active member of the CoP. This process is limited in the History Teacher Forum as only 50 of the 700 members participated. This was

possibly due to the marginalisation of the majority of members due to the provocative actions of a minority.

The following example is a distributed CoP that has high levels of participation.

2.6.2 MirandaNet

MirandaNet began as a project with the computer company Toshiba and grew into a thriving distributed CoP made up of teachers and members from other professions. A peer review mechanism and strict entry requirements ensures a high quality of participant. Uniquely, this distributed CoP primarily uses email and a listserv to drive the interaction in addition to a website for publications .

Cuthell (2004) attributes MirandaNet's success to the use of email as a means of communication. This means that participants do not have to log into a website, they avoid passwords and rather receive information in their "inboxes". Two other reasons are related to the fact that MirandaNet organises face-to-face meetings and that the members, while primarily drawn from the United Kingdom, include international members. The face-to-face meetings allow space for the social nuances lacking in an online environment and the international component provides a dynamic environment of intellectual exchange.

Email has become the predominant means of Computer Mediated Communication (CMC) . Email is also recognised as a legitimate form of communication for distributed CoPs . Email lacks the nuances and cues present in face-to-face encounters, one of the constraints of a distributed CoP, but writing can result in clearer and well-thought-out expression, especially in an asynchronous environment .

2.6.3 e-Yethu Project

The e-Yethu project, reported on by Hodgkison-Williams and Brandt, was developed to facilitate the uptake of ICT by teachers in schools in Grahamstown, South Africa.

The theoretical framework of this project is firmly rooted in the social constructivist learning theory of Wenger and Lave. The emphasis of the project was the development of a distributed CoP.

The e-Yethu project used three strategies to sustain a distributed CoP: the maintenance of a wiki, an electronic mailing list and the “glue” of the project, face-to-face meetings every Friday. The face-to-face meetings were considered critical for the formation of a sustainable CoP successful in promoting the use of ICT .

What is particularly pertinent is that this CoP benefits several disadvantaged schools, provides a model for ICT development in South Africa and generally demonstrates the potential of distributed CoPs for teacher professional development in South Africa.

The relevance of distributed CoPs for the professional development of teachers globally and in South Africa has been established. While distributed CoPs are not to be romanticised and have significant drawbacks their impact is tangible in many spheres of human activity.

2.7 Conclusion

Knowledge management identifies knowledge as explicit and implicit. CoPs are seen as a way to manage the implicit knowledge. CoPs are defined by social learning theory and the concept was made explicit by Etienne Wenger and Jean Lave. A wide range of definitions of CoPs abound due to the broad definition that Wenger offers but essentially it is a group of people that operate as community, focus on a certain domain, through a variety of practices. CoPs have followed the technological trends and distributed CoPs use a range of Internet based resources, e.g. email, websites, file-sharing, etc. Distributed CoPs need at least one face-to-face annual meeting, where, at a minimum, the core members of the CoP meet.

CoPs interact through a process of boundary crossing facilitated by brokers and artefact movement. Learning takes place through identity formation, fed by the process of negotiation of meaning, which consists of the duality of participation and reification. Members who do not actively participate can still be on an inbound trajectory through a process of legitimate peripheral participation. Passionate leadership, membership support and institutional approval are all essential for the formation and sustainability of a CoP.

Email was highlighted as an effective means of CMC because of its ease of use. One of the most successful educationally-focused distributed CoPs, MirandaNET, uses email.

CoPs can provide the environment necessary for professional development of teachers in South Africa, despite the challenges of distance, lack of resources, etc. The e-Yethu project is a South African example of a distributed CoP that promotes professional development amongst educators.

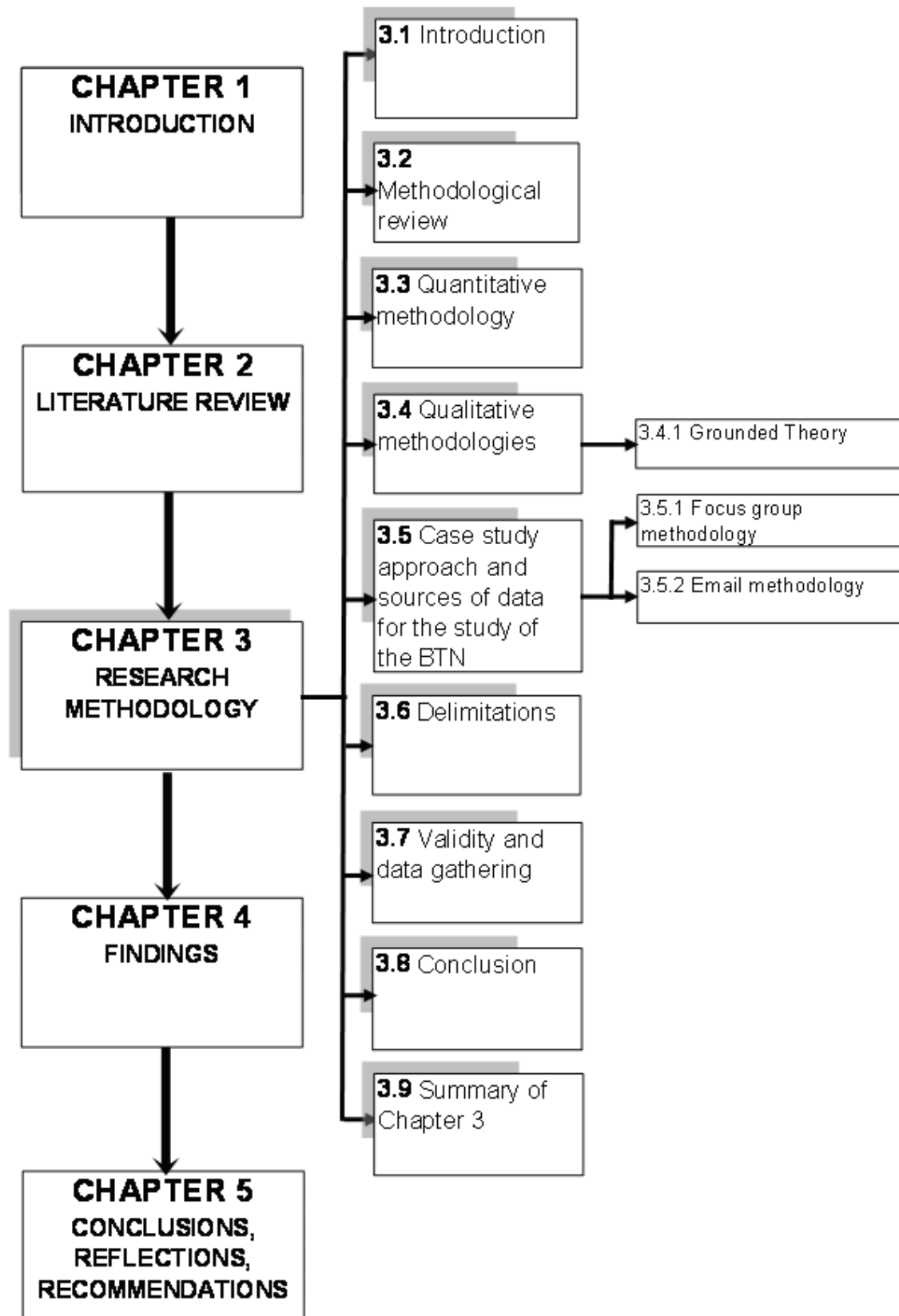
2.8 Summary of Chapter 2

The methodology of the literature review was described and Google Scholar proved to be the most useful search engine as it efficiently generated the most articles. The literature revealed a wide range of articles on the topic of CoPs, although there was less focus on secondary education, especially in the South African context.

Etienne Wenger is the undisputed subject expert and provided much of the theoretical underpinning of CoPs and with respect to distributed CoPs the debate in the literature revolved around the role and frequency of face-to-face interactions and advice on how to initiate and sustain a distributed CoP.

The relevance of distributed CoPs as a possible means of teacher professional development in South Africa was discussed. Three examples of distributed CoPs were described to provide concrete examples of the theoretical framework constructed in the chapter.

The research methodologies mentioned in Chapter 2 are elaborated upon in Chapter 3. Chapter 3 describes the methodologies, their implementation and how the data was analysed. The chapter also provides a philosophical underpinning for the research methodology and analysis.



Chapter 3 Research methodology

3.1 Introduction

Chapter 3 is a review of the literature pertaining to the research methodology used to address the research questions. The chapter also offers a description of the methods and analysis processes used to construct an accurate case study of the BTN. A quantitative approach is discussed, but the primary focus of the chapter is the qualitative approach, specifically a case study approach. Two sources of data (a focus group interview and emails) are examined as well as the three evaluative tools.

The three evaluative tools used to analyse the data are: i) 21 structural characteristics of a distributed CoP; ii) 14 indicators of a CoP; and iii) a seven level scale of descriptors to measure teacher reflective practice. A short summary of Grounded Theory is included to provide a theoretical underpinning for the research methodology.

3.2 Methodological review

Johnson's review of CoP literature reveals that the most common qualitative methodology used to study CoPs and distributed CoPs is a case study. This is because the case study design has the "flexibility and adoptability to a range of contexts, processes, people and foci" and "provides some of the most useful methods available in educational research" .

On the quantitative side there have been some recent developments in spatial analysis that can graphically illustrate the structure of distributed CoPs, especially in large organisations.

3.3 Quantitative methodology

A qualitative approach was followed and a discussion on an example of a quantitative methodology highlights why a qualitative approach was more suitable.

An efficient method of spatial analysis is described by Tyler, Wilkinson, & Humberman . The method involves a fully automated technique of identifying CoPs within an organisation using email data. Their choice of email is based on its ubiquity. They also used interviews (a qualitative methodology) to verify their data.

Spatial analysis, as a methodology, is applicable to large organisations that want to identify 'hidden' distributed CoPs over and above the formal hierarchical structure, and is not applicable to a study of a small CoP such as the BTN. A quantitative approach is not recommended by the proponents of CoPs because quantitative data is a static measure .

3.4 Qualitative methodologies

Case studies are the most prevalent form of methodology for studying distributed CoPs and several tools are used to gather and analyse the data. The theoretical framework supporting the case study methodology is drawn from the Naturalistic and participant-orientated tradition. This philosophy uses a holistic approach, drawing on a multiplicity of data from several sources. It relies on an emergent design and inductive reasoning, thereby accommodating multiple realities instead of a single reality . The design is specifically suited to researching a single phenomenon such as the BTN .

A case study is qualitative in nature and hence descriptive. The object of a case study is to metaphorically facilitate a process of crystallisation where the meaning from a saturated solution of data crystallises around a seed crystal.

The analysis of the data from a case study is often based on Grounded Theory. In order to contextualise the description of the evaluative tools a short discussion of Grounded Theory follows.

3.4.1 Grounded Theory

Two key aspects of Grounded Theory are found in the literature. The first confirms that it is possible to generate theory and achieve understanding from the qualitative data that is grounded in the lived experiences of the individuals in question. The second allows for flexibility and evolution in the process of research. These aspects provided the foundation for the research approach followed in this study.

Grounded Theory depends upon the researcher being able to think about what he or she is doing during the research process. When this iterative process of knowing-in-action is enacted consistently and reliably, the result is a data condition termed saturation. Saturation indicates a condition where no new data is found.

This process is intensely creative and human, involving meaning-making and not a passive discovery of meaning in the data. In other words “theory should not precede research but follow it”.

A criticism of Grounded Theory is that it has the potential to generate a multiplicity of interpretations which may affect the validity of the analysis of the data. Hence, the need for the rigorous implementation of case study methodology at every step.

This theoretical discussion provides the backdrop to understanding how a case study that gathers data from a focus group interview and a collection of emails can be effectively and rigorously interpreted to provide meaningful conclusions. This next section describes the methods of gathering, organisation and analysis of the data.

3.5 *Case study approach and sources of data for the study of the BTN*

Two sources were used to gather the data for the case study of the BTN. They are:

- i) focus group (see Addendum 1)
- ii) email data (see Addendum 2)

Each of these sources is described in the following section, with an emphasis on the issues of validity.

3.5.1 Focus group methodology

The interview process is “part of life itself, its human embeddedness is inescapable” . The choice of a focus group interview matched the intensely human nature of the BTN. There is a connection between the focus group methodology and CoPs as CoPs are also about the interactions between humans.

A focus group is also a form of convenience sampling. In this specific study the participants of the focus group are all colleagues at Western Cape Independent schools and are obliged by the IEB to meet twice a year as a cluster group. I sent out an email requesting their participation in a 20 minute focus group discussion which would be conducted after the main meeting. I received permission from the cluster leader, who was very supportive of the request. I did not, however, receive any confirmations via email from my colleagues, but on arrival at the meeting there was general agreement that if there was time they would stay behind to conduct the focus group. Inevitably the meeting ran over time but three colleagues were able to stay behind and participate.

Confidentiality was promised to the participants and it was maintained by assigning random letters to their names. There were two reasons for confidentiality. The first was an attempt to remove any barriers to voluntary participation in the focus group and the second was that even though the methodology was a case study, identity was not necessary.

The focus group met in the staff room of one of the schools. There was minimal disturbance as it was a Friday afternoon and most staff members had left the building. If anything, the situation of a staff room contributed to the high level of comfort displayed by the participants. The group appeared relaxed and humour and banter permeated the focus group discussion. The interview began at 16:33 and lasted 21 minutes. The interview was recorded using a DVD Recorder, mounted on a tripod. A test clip was recorded and the camera was repositioned to order to include the interviewer in the recording.

I began the interview by interrupting a discussion about the new grade 10 syllabus so the participants were “warmed up”. I assured them of confidentiality which was met with humour and feigned disappointment that they would not be receiving any glory. The relaxed beginning to the focus group certainly helped ease the discussion and the participants were more than willing to share their views about the BTN. They were not afraid to criticise the BTN and even made suggestions for improvements, e.g. making the subject line in the emails clearer.

I consider these observations to indicate that there was a high level of internal validity and that the participants were speaking their minds and not trying to ingratiate or please me.

The interview process and ensuring validity

I chose a non-directive interview approach as I am familiar with this method through my training as a Life Line counsellor and attendance of a workshop run by Carl Rogers⁵. The goal of training at Life Line is to ensure that the counsellor is as non-judgemental and as objective as possible, which allows the researcher to “get at the deeper attitudes and perceptions of the person being interviewed in such a way as to free them from interviewer bias” . The level of validity increases as researcher bias is reduced.

I felt entirely comfortable with the process of the interview and although I was conscious that I was taking up the valuable time of my colleagues I appreciated that they were quite willing to help out. That is why I kept the focus group to 20 minutes. I was also aware that I was not sure what I was looking for and tried and succeeded in remaining open-minded and non-judgemental. In a sense I surrendered myself to the process and let the focus group develop a life of its own. I did prepare some questions but tried to consciously let the currents of the focus group take me, rather than me trying to paddle against the stream. The end result was that I had a positive experience of the focus group and the thanks I received at the conclusion of the interview confirmed that the participants had enjoyed a positive experience.

Initial analysis

Data analysis is considered to be the most difficult and crucial aspects of qualitative research . A decision was made to manually code the transcript from the focus group (see Addendum 1) as the use of software would have required learning a new programme such as NVivo or Atlas TI. The choice of electronic or manual coding depends on funding, time, the size of the project and the expertise of the researcher. As I am unfunded, do not have the time and lack the necessary expertise the prudent route was to manually code the transcript of the focus group for analysis purposes.

I played the DVD through a computer and listened to the interview through earphones. This procedure allowed me to start, stop, play, fast forward and rewind

⁵ Carl Rogers is the originator of the concept of “Reflective Listening” as a counselling technique.

the recording from any point. A visual bar with a percentage and time reading was very useful for orientation purposes. During the act of listening I made initial field notes.

I transcribed the interview myself as the process of transcription gave me a sense of the data. The earphones helped to focus my concentration on the recording.

Final analysis

I transcribed the interview into a word processor and then analysed the data. I made field notes using the comment function of word processor so that I could link the comments with the data.

Finally, I collected all the field notes and rearranged the similar notes into clusters. Through this process I was able to extract several themes and became intimately familiar with the content of the interview.

3.5.2 Email methodology

Over 250 emails were sent and received by members of the BTN between February 2004 and 2006. The emails were sent to me and I forwarded them to the members of the BTN. All the emails were saved in a folder in my email account at Bridge House School.

A purposeful sampling procedure was followed and all the emails from February 2004 to February 2006 were selected for analysis (see Addendum 2). The 2004 emails were chosen as they are reifications of the beginnings of the BTN and the 2005/6 emails were selected as they represent a year between IEB Biology teacher conferences where the majority of the members of the BTN met face-to-face.

The sample email was opened and the header data was copied and pasted into a row in a spreadsheet. The header, sender, recipient and time-sent fell neatly into separate cells and provided a temporal view of the data.

I copied and pasted the message into a comment box so that when I placed the cursor in the next cell in the row the message would appear. The final step was to open any attachments, save them in central folder and create a hyperlink to that

attachment in the next cell in the row. At the end of this process each row in the spreadsheet contained cells under relevant column headings that graphically displayed the information of the emails.

Initial analysis of email data

Email is the primary form of communication for the BTN. In order to establish the quality of the email traffic as it pertains to a distributed CoP, a classification system based on reflective practice was adapted from Hough, Smithey and Everston . These researchers were interested in the reflective practice of intern teachers and analysed the online postings of the intern teachers according a seven level scale of descriptors.

The levels ranged from level one, where the posting was unrelated to the teaching practice through to level seven, where the posting contained reflections that used correct pedagogical terminology and included references to a theoretical framework, e.g. Constructivism. The level seven reflection was also relevant to the contextual considerations of the discussion, including ethical, moral or political issues. Once the postings were classified they were analysed using the statistical package SPSS.

The level descriptors are reproduced here but without the examples provided by Hough, Smithey and Everston (2004).

Table 4: Level descriptors of reflection for classifying online postings of teacher reflective practice

Level	<i>Descriptor. Events and experiences are described:</i>
1	<ul style="list-style-type: none"> • <i>with no description of a classroom event and the message is unrelated to practice</i>
2	<ul style="list-style-type: none"> • <i>in simple, layperson terms, still generally unattached to classroom activities</i>
3	<ul style="list-style-type: none"> • <i>in appropriate pedagogical terms</i>
4	<ul style="list-style-type: none"> • <i>using appropriate pedagogical terms</i> • <i>using a rationale that relies upon traditional or personal preference</i>
5	<ul style="list-style-type: none"> • <i>using appropriate pedagogical terms</i> • <i>using a rationale that relies upon principle or theory</i>
6	<ul style="list-style-type: none"> • <i>using appropriate pedagogical terms</i> • <i>including a rationale that relies upon principle or theory</i> • <i>considering contextual factors</i>
7	<ul style="list-style-type: none"> • <i>using appropriate pedagogical terms</i> • <i>including a rationale that relies upon a principle or theory</i> • <i>considering contextual factors</i> • <i>considering contextual ethical, moral or political issues</i>

The seven level scale of descriptors was used as an analysis tool for the data collected for this study; however, no statistical tests were used to analyse the data.

Final analysis of email data

While I was busy with the process of organising the email data I made field notes in the cell adjacent to the hyperlinked attachment cell and headed the column “Initial Field Notes”. I then re-read the emails and added to the field notes and used Table 4 as a guide to classify a sample of the emails that exemplified the process of reflective practice. I did not classify all the emails according to Table 4 because the focus of the study is not to quantify the levels of reflection but to rather establish if reflective practice had taken place in the limited environment of email communication. Once this process was complete I then reread through the emails and field notes and added any further insights in the field note cells. This data was then used to synthesise the findings in Chapter 4.

3.6 Delimitations

The collected data was from two sources: email traffic and a focus group interview. The aim of the data collection was to be able to produce a detailed and focused description of the phenomenon of a distributed CoP known as the BTN. The intention was to understand the phenomenon and describe it as accurately and faithfully as possible. Due to time constraints and the limited nature of the mini-dissertation there were many aspects of the BTN that were not studied, e.g. the specific demographics of the members, their IT skills, etc., and therefore this study cannot produce an entirely comprehensive picture of the BTN.

3.7 Validity and data gathering

There are two main threats to the validity of data gathering. These are reactivity effects and the lack of standardised procedures for gathering data.

The reactivity effects were most likely in the interview, but as stated the interview process was made as natural as possible and the interviewees were comfortable with the process. The use of a spreadsheet to organise the data from the emails and the use of the comment function in a word processor to record the initial field notes minimised the threat to validity of non-systematic data gathering.

Of further concern was the role of myself as a participant observer. The concern was that my presence as the moderator of the BTN would alter the behaviour of the members when I started the research. This effect was not evident in the interview process, and as stated earlier, the interviewees even criticised the content of the subject lines of the emails. I took this readiness to criticise as a sign that their honesty was not compromised.

3.8 Conclusion

A case study approach, based on the Naturalistic tradition of qualitative research, was identified as the most suitable methodology for researching a phenomenon such as the BTN. A sample of emails and a focus group interview were identified as appropriate sources of data for the case study methodology. The validity of the data

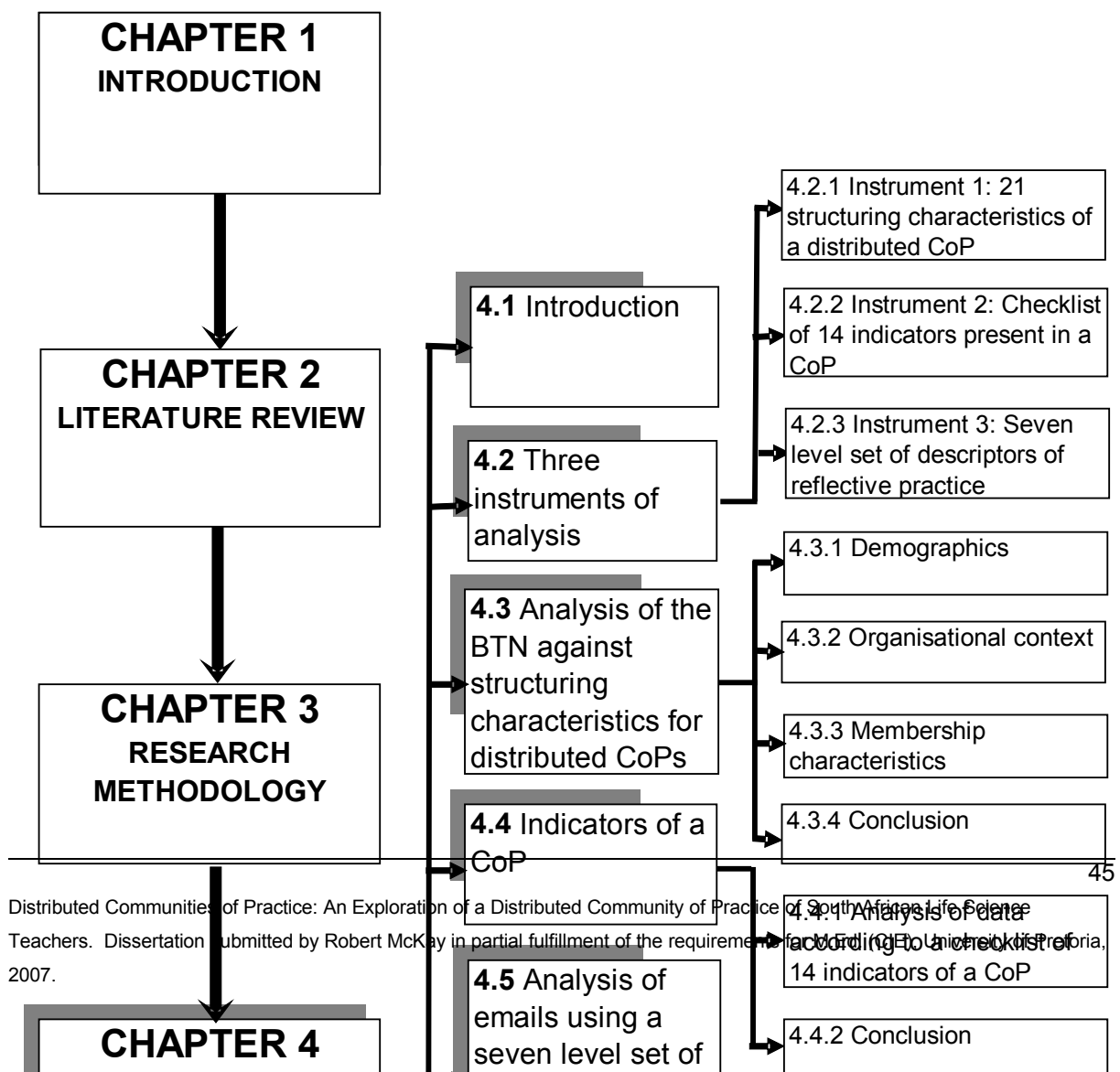
gathering process was achieved through rigorous attention to the methodology as suggested by the proponents of Grounded Theory.

Validity issues were also addressed during the initial analysis of the data from each of the sources. The data gathered for the study was trustworthy and a high level of integrity was applied.

3.9 Summary of Chapter 3

Chapter 3 began with a review of the literature pertaining to the methodologies used to research CoPs and distributed CoPs. The case study methodology emerged as the best option. The second part of the chapter was devoted to describing the data gathering and analysis processes with reference to ensuring the validity, trustworthiness and integrity of these processes.

The data gathering and analysis processes yielded a focused description of the phenomenon and the findings that are discussed in Chapter 4. Chapter 4 details the three instruments that were used to analyse the data (email analysis has already been discussed). The findings from the process of analysis using the three instruments are discussed in Chapter 4.



Chapter 4 Findings

4.1 Introduction

The aim of this chapter is to offer a rich description and further analysis of the BTN in order to answer the critical research question: What perceived events are observable in the phenomenon known as the Biology Teachers Network?

Wenger cautions against the development of a “simple metric that would yield a clear cut answer for each of the social configurations ... by specifying exact ranges of size, duration, proximity, amount of interaction or types of activities”. The social configurations he is referring to are the variants of CoPs. In order to avoid this hazard of measuring the trees without seeing the forest, so to speak, three separate instruments are used to sift through the data. The use of these three instruments enables the researcher to view the data from a variety of perspectives. Each perspective adds a different aspect to the overall description of the BTN.

The data sets are the emails exchanged between the members of the BTN from early 2004 to February 2006 and a focus group interview with three members of the BTN. The three instruments used to analyse the data are a set of 21 structuring characteristics of a distributed CoP, a check list of 14 indicators and a set of level descriptors for evaluating reflective practice from online postings (as discussed in Chapter 3). The three instruments are revisited in the next section.

4.2 Three instruments of analysis

4.2.1 Instrument 1: 21 structuring characteristics of a distributed CoP

Dubé, Bourhis, & Jacob developed a list of 21 structuring characteristics of a distributed CoP. The characteristics are summarised in Table 2 and the data was analysed using this matrix.

4.2.2 Instrument 2: Checklist of 14 indicators present in a CoP

The second instrument is a check list of criteria, suggested by Wenger, as indicators of a CoP. The list is summarised in this chapter and the data was analysed using the check list of indicators.

4.2.3 Instrument 3: Seven level set of descriptors of reflective practice

The third instrument is a classification scheme for online discussion that provides a measure of reflective practice. A selected set of emails was analysed using this classification scheme after Hough, Smithey and Everston (2004). The scheme is summarised in Table 4 in Chapter 3.

4.3 Analysis of the BTN against structuring characteristics of distributed CoPs

Each of the 21 structuring characteristics will be dealt with separately with supportive evidence from the email data, the focus group or the story.

4.3.1 Demographics

The data for the demographics for the BTN are drawn mainly from my own observations and supportive data from the emails. The spontaneous origin of the BTN makes its orientation operational. The BTN has been in existence for three years and its membership has grown from the five founder members to the 104 to date. The first attempts at forming the BTN were through Yahoo but only four teachers were successful in registering and becoming part of the Yahoo group. Considering the growth of the BTN, its life span could be considered to be more permanent than temporary, but its age is still young.

4.3.2 Organisational context

The Organisational context is broken down into five sub-categories and each will be dealt with individually.

Boundary crossing

CoPs do not exist in isolation and make contact with other CoPs. Evidence of boundary crossing is in the emails, sent and received, by teachers from non-IEB schools who provide a Government perspective on issues. The following email quote from a non-IEB teacher highlights the contribution a non-IEB teacher can make to the debate surrounding the implementation of the Further Education and Training (FET) phase.

“Do you have copies of the doc handed out by the dept at the training session in June (I have a copy of a copy of a copy so looking fairly faint by now) of a booklet called Life Sciences Resources for educators; subject orientation 2005 where they give exemplars of work schedules for each grade which include how long to spend on each section in each grade?” email sent: 2005/09/08 09:58

Boundary crossing is an indication of the vitality of the BTN and is critical for the sustainability of the BTN. The phenomenon of boundary crossing promotes the integration of new ideas and concepts into the BTN.

Environment, organisational slack and degree of Institutionalised formalism

As stated earlier, the BTN was formed from the bottom up on the initiative of a practitioner (in this case myself). The only permission sought was from the members themselves, and this occurred at the annual 2003 IEB Biology teachers' conference. As a result, in 2007 the organisational slack is high and while the BTN is not unrecognised it is certainly not institutionalised. The only formal organisation that could have any role in overseeing the BTN is the IEB and there has only been support for the BTN. The IEB representative for Biology is on the mailing list and is party to any emails that deal with the IEB. There is no evidence that this has restricted the BTN in any way and the following quote illustrates that the members are quite willing to speak their mind even if it involves a product from the IEB. In this case the discussion surrounds a final exam which was set by examiners appointed by the IEB.

“We are having a small freak about the exam. In particular what is Barfoed's? Is it Fehlings? Why is there such a large practical component examined? Since when is stomatal opening and closing in the exam? Dichotomous keys haven't been required forever? Nothing on the ear? No pop dynamics in section B and an exact replica of a recent previous exam essay”. Email sent: 2005/10/31 13:00

While the IEB representative did not reply to the email (there is formal examiners' report- back at the conference) the author of the email could take solace in the fact that their concerns were shared with others on the network.

Leadership

Leadership is considered to be critical for the initiation and sustainability of a distributed CoP. Passionate leadership is at the core of the BTN and a small group of committed core members has developed. Of the emails sent in 2004 and 2005, 22 members sent more than one email, and of those, 10 sent more than five emails. As a participant observer, it is difficult to comment on one's own leadership of the BTN but several emails of thanks are testament to the effectiveness of the leadership.

My passion is evident in an early email:

“I will check it out and see what the problem is ... teething problems ... please stick with this because it does work ... trust me” Email sent on: 2004/06/06 14:53

I further explain my motivations in an email that reveals my less altruistic motivations.

“Not a schlep at all. My aim is to increase collaboration via the Internet as it is such an amazing tool for us teachers. I benefit as well as I expand my resources and I am also a "single department" teacher so it keeps me in the loop of things ... so like most things in life it looks altruistic but it has fair dose of self interest ...” Email sent on: 2005/05/09 09:39

However, I seem to have the personality of a maven,⁶ and I am baffled that anyone would not want to share information. It does not enter my realm of thought. This email sent in May 2005 epitomises my thinking.

⁶ A maven is a personality type that is happy to share knowledge with anyone .

I think there is a mindset about sharing and as you say people don't think that their work is worth sharing ... I am not even going to contemplate that there are selfish people out there who won't share. I still get requests for the CD of work, so clearly people are into the taking side of sharing. But it will grow ... in time.

There are incredible things that can be done with technology that can enhance our teaching and make it more fun for us and the kids... Email sent on: 2005/05/03 13:06

The leadership of the BTN is appreciated by the members and is supported by a core group of participants.

4.3.3 Membership characteristics

There are several sub-categories of membership characteristics. There was no formal survey of the members' characteristics for this study but many of the attributes are evident in the data.

4.3.3.1 Size and geographic distribution

As mentioned earlier, the current size of the BTN is 104 members. The members are primarily Biology teachers in schools all over South Africa with Namibians providing an international component. The dispersion is such that the only time the teachers have formal face-to-face contact is at the annual Biology Teachers' Conference (generally reserved for the Heads of Department) and at regional cluster meetings that have to occur at least twice a year. Any other contact is dependant on geographic proximity.

4.3.3.2 Member selection, stability, enrolment and cultural diversity

The BTN is open to anyone who wishes to join voluntarily. The membership has increased steadily and the IEB conference provides ample opportunity for recruitment. In order to join, all a potential member does is send an email to the moderator who adds them to an address book. Generally a welcome email goes out after the person's name has been entered. An example is cited below:

“Dear Rob

Would you please be so kind as to put my name on your mailing list for Biology teachers? If there are any costs involved, please let me know and I will pay you during marking.

Take care and thank you.” Email sent: 2005/11/26 01:03

This email also highlights the informal and friendly nature of the BTN and the willingness to contribute to any costs (which apart from an annual CD-ROM are non-existent). It shows that the members are willing to make a sacrifice to be part of the network.

The term cultural diversity does not refer to race but rather to a shared language, profession and vision. While there are no emails in another language there are members who are teachers in Afrikaans medium schools. In terms of profession and vision, the members of the BTN are broadly aligned and subscribe to a philosophy of Independent Education. This has become an issue in recent years as government oversight, has increased as illustrated in the following email:

“As far as I understand it, the IEB is bound (by UMALUSI)⁷ to follow the state and will not enjoy very much autonomy.” Email sent on: 2005/09/13 11:52

The BTN is an open and welcoming network. The regular sending and receiving of emails indicates a reasonable level of stability, and the participation of teachers from diverse backgrounds indicates an acceptable level of cultural diversity.

4.3.3.3 Members’ prior experience

While there is no direct evidence in the emails of whether the membership had any prior experience of an electronic mailing list, there was a definite bafflement when I initially suggested the formation of such a list. The limited response to the Yahoo sign up was an indication that most IEB Biology teachers had limited experience of electronic mailing lists. The members of the focus group were asked if they had had any prior experience and the answer was a unanimous “no”.

⁷ UMALUSI (the Shepard) is the accreditation body that monitors all national education institutions, including Independent Schools who subscribe to the IEB.

4.3.3.4 Members' ICT literacy, reliance on ICT and ICT availability.

No formal survey or skills inventory was undertaken, but again the inability to sign onto Yahoo and register, the low initial sign up rate and the subsequent relative success of a manually operated email list indicates that even though the original members of the BTN come from well-resourced schools the ICT skills were lacking at the inception of the BTN.

The following email illustrates the point.

“Hi Rob, the concern is the getting into being allowed to be part of it from the beginning - the process. I emailed you, as we were told at conference. You responded and then theoretically I could be part of the group. But when I go to the side it asks me user name and password. I type in my email address, and then try and give it a password to start with, but it says the password is invalid. Is there a set password for all of us? This is the step where all of us are getting bogged down. It has the facility to ask questions, but the answers don't apply.” Email sent 04/06/2004 13:51:37

The focus group also revealed a distinct dislike for websites as an administrative tool because of the time it takes to log on and the use of a password and user name.

P: and I don't want to, I mean fundamentally I don't want to, I don't want to run around after someone else's website, where I've got to check and then I've got to enter a password, and then I don't know the password ...

J: and it's always WZT4 (laughter)

The excerpt from the interview also revealed that teachers often receive several emails in a day and that even if they are employed at a well-resourced school the network is still slow as there are so many users. The time to check a website, in case there is something of interest, is not available and the email system was considered to be a more efficient means of communication.

The BTN has fostered an increase in the level of the ICT skills of the members through the problem solving that has taken place. A subsequent email from a member celebrates the newly acquired skill of zipping a file in order to compress it.

This is one of the benefits of the BTN, i.e. the general increase in basic ICT skills membership.

“Rob I was just reading your email explaining how to zip and email a document and decided to try it on the photosynthesis worksheet I had just completed and it went from a 3,564 KB document to something like 305 KB and it was also really easy. Won't one of you let me know if you can open this and if its layout is okay? This is definitely the way to go - it is so exciting as it means that I can now send a lot of my large worksheets and tests easily via email. WOW. Thanks Rob.” Email sent 2005/09/10 08:51 PM.

This email was sent on the 10th of September 2005, a full year and a half after the launch of the BTN. It was also sent by a member who is a prolific sharer and would be counted as having relatively high ICT skills within the BTN. However, the email does not just illustrate the adherence to a reified instruction. The member also engaged in a process of participation and as a result learning took place through the process of negotiation of meaning.

The process of negotiation of meaning is a central feature of CoPs and is further illustrated by the following sequence of emails. The sequence contains evidence that the member, quoted below, has a fairly sophisticated knowledge of the workings of the Internet and is familiar with the process of the file transfer protocol (FTP). However, the process was never enacted due to the lack of support from the ICT staff at the school. The first email describes the difficulties of sharing via a website called Rapidshare⁸.

“I have one problem with Rapid Share - it does not allow me to download the files because we have a proxy server. Any ideas?” Email sent 2005/08/02 12:16

As the facilitator, I had no solution to the problem and when the email went out to the BTN, no one responded. However, the member persevered and 20 days later reported that a solution was imminent.

“Sorry, our IT guy has not quite got his ducks in a row regarding the FTP

⁸ Rapidshare.com is a website that allows a user to upload and download documents free of charge. The website caches the documents for three months. The site was used as an alternative to Yahoo but was never successfully used by the members of the BTN.

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server - hope this week might be more possible. In the meantime, here are a couple of things I thought might be useful - two pracs, a rap and some pics - can't remember if I have sent some of them to you before. The pics open in Word - I use them as slides.

PS - Oh - the pics won't load in a folder. Need to think about this one. Will need to zip them? Sorry." Email sent 2005/08/22 11:03

Another 20 days followed and then an explanation was forthcoming which revealed a host of ICT and human problems, including the absence of IT support, illness and a server crash.

"Do you remember the problem that I was having downloading from Rapidshare because of our Proxy server and you zipped some files to send me when I let you have an FTP address? Well, here it is if you still have the files? Sorry it's so late but first our IT guy was away, then I spent a week in bed and then he was hectic because our server went down." Email sent: 2005/09/12 16:15

The fact that ICT can be fickle is well known and this interaction reveals that over a period of 40 days a teacher at a resourced school with IT support was not able to implement the relatively simple process of a FTP in order to share material over the Internet.

In another example the lack of ICT skills limited the quality of the shared work. This particular member produced electronic copies of her work but she lacked the skills to scan in pictures.

"Hi Rob, These may be of use - sorry I could not get the graph to go through, my computer skills are basic." Email sent on: 2005/07/23 19:59

The BTN is reliant on ICT as its primary means of communication is email. This is seen as way of continuing the face-to-face interaction that occurs at the annual IEB Biology Teachers' conference and the IEB mandated regional cluster meetings. A member of the focus group summarised this structural characteristic in the form of a metaphor of a castaway. In the analogy the castaway receives provisions through the medium of email and although still on an island he or she is no longer isolated.

“I think we are largely all too busy to make face to face contact with people outside of your school, I mean you guys I see four times a year, and I never phone you in between, its not to say that I wouldn't like to, I find these meetings always incredibly valuable, because you always sit down, there are certain things, you can only do face to face, they are incredibly valuable to do that, but when you can do that, you are an island essentially, and I think what you, what, what your service is offering, it makes you, it makes you an island that gets provisions, in other words you are not really like a um, watch you call it, (castaway) like a um sole survivor, you are not like a castaway anymore, which is what you could be like, and certainly people have been like, you now are like a, like a castaway but you are getting provisions in and, and its up you to obviously choose to decide what you are going to use and how you want to use it, but it is there and if you ever feeling like a castaway, you just send an email and you'll get a responses back, so I think, I think how well it works for you depends on how much you are willing to also get involved in this.”

The advantages of the BTN as a way of supporting the work at the annual conference and cluster groups is evident in the following extract from the interview.

J: We only see each other 3 times a year and also

Myself: You have colleagues who support you at school and that kind of thing?

J: No but it's not the same, because you've got one or two colleagues but you...

P: If you are lucky.

J: If you're lucky, sometimes you don't, but also you don't necessarily have experts or you can have contact with other experts, I consider M an expert, so having contact with her provides me with extra stuff that I wouldn't necessarily get here, and hopefully from like also some other people, who also glean things from me, so you meet up with people who can support you sometimes with more than what you got.

There is a high degree of reliance on ICT but it is of a low level. When the levels of ICT were extended to more unusual procedures, such as FTP, the obstacles proved to be difficult to surmount and the members resorted to attaching documents to the emails.

4.3.4 Conclusion

The BTN was analysed using the structuring characteristics of a distributed CoP listed in Table 2. There was enough evidence to form a broad picture of the BTN and secure its place as a distributed CoP that uses email as the primary means of communication.

4.4 Indicators of a CoP

Wenger suggests 14 indicators are apparent in the discourse of the members of a functioning CoP. The data was scrutinised using the 14 indicators in order to ascertain if all or only certain of the criteria were present. The 14 indicators are repeated below:

Check list of 14 indicators present in a CoP :

- Sustained mutual relationships – harmonious or conflictual
- Shared ways of engaging and doing things
- Rapid flow of information and the propagation of innovation
- Absence of introductory preambles
- Very quick set up of a problem to be discussed
- Substantial overlap in the participants' descriptions of who belongs
- Knowing what others know, what they can do and how they can contribute to an enterprise
- Mutually defining identities
- Ability to assess the appropriateness of actions and products
- Specific tools, representation and other artefacts
- Local lore, shared stories, inside jokes, knowing laughter
- Jargon and shortcuts to communication
- Certain styles recognised as displaying membership
- Shared discourse reflecting a certain perspective on the world

The data was analysed using these 14 criteria.

4.4.1 Analysis of data according to a checklist of 14 indicators of a CoP

The first criterion refers to the formation of sustained mutual relationships, whether they are harmonious or conflictual. While the members of the BTN are geographically distributed, participation in the BTN has resulted in relationships becoming stronger than they would have without the BTN. One member of the focus group summed up this development by saying:

“No, it (the BTN) certainly helped me to get to know, well I mean I’ve met JP, AP, whose names now roll off my tongue, like I know them well, I have only met them once or twice and I have seen them. I have only seen them at marking and I and I’ve seen them at conference, but from that I would never have begun to realise, just what incredible work they are doing and what incredible research they are doing.”

This quote also serves to illustrate another indicator, which describes members of a CoP “knowing what others know, what they can do and how they can contribute to an enterprise” .

The most prolific means of engaging and doing things together for the BTN is the exchange of information in the form of attachments or links to other sites. For example, one member was quite animated when sharing this resource.

“Thank you for all the info that you share with us. I found something that I just HAVE to share with you all! Please could you pass on to the others on your mailing list? It is a wonderful interactive programme on cloning. Google -clickandclone. Be patient, it takes time to load - but is worth it.” Email sent on: 2005/05/06 15:06

This example illustrates several indicators. The emails result in the rapid flow of information which then results in the propagation of innovation. The email is also an example of a form of representation. The BTN members share information using attachments which are then saved and burned onto CD-ROMs for distribution at the annual IEB Biology Teachers’ conference. This is an example of the indicator of representation of artefacts.

This rapid flow of information via email also lends itself to the setting up of problems to be discussed asynchronously and is an efficient way of gathering information as illustrated by this quote from a member of the focus group.

“If I have looked through my genetics file and I don't like the test I got and I want a new one, um the fastest way to get it is to email you and to say ... you know what's going on and that email goes out ... half an hour later I have got one from JP and I'm sorted.”

An informal form of communication (defined as the absence of introductory preamble that gives the impression that interactions are the continuation of an ongoing process) is evident in the data. The email below illustrates the perfunctory nature of the communication and also highlights another indicator: that of the use of jargon and shortcuts to communication. In this case the phrase “give exemplars of work schedules for each grade” would only be understood by the members of the BTN.

“Hi Rob

Do you have copies of the doc handed out by the dept at the training session in June (I have a copy of a copy of a copy so looking fairly faint by now) of a booklet called Life Sciences Resources for educators; subject orientation 2005 where they give exemplars of work schedules for each grade which include how long to spend on each section in each grade?

Regards C”

Email sent 08/09/2005 10:01

The following email has several indicators of a CoP including shared stories, humour and the ability to assess the appropriateness of actions and products. The email is a reflection on an IEB practical exam for the Grade 12 year.

“Well, we ran the CTA today, and in the one class the squares rose so quickly, that the kids could not time them, so we told the second class to pump the syringe to death, so they did, and then it took so long to rise that it was no good - the one kid waited 12 minutes and they didn't rise. The problem then is that there are no bubbles to observe either!!!!!!!!!! So I had to tell them to go and look at another child's beaker.”

Email sent: 2005/09/09 05:02 PM

Non-members of the BTN could not have understood that the practical exam consisted of measuring the rise rate of squares of ivy leaves that had been degassed by a syringe. They would have also not understood the term CTA used as an acronym for “Continuous Task of Assessment”. A member of the BTN is familiar with the jargon and would have found the image of a student having to “pump a syringe to death” humorous. This shared discourse is also borne out by the use of the word “child” and “kid” in place of learner or student. While the reasons for the choice of these words are beyond the scope of this study, they betray a world view that expects a mutual relationship of respect between teacher and student.

The biological concept of evolution is part of the FET syllabus, and the following email illustrates an example of communication as part of the process of developing a shared discourse and perspective on the world:

“Hi Rob

I have put together a document that some biology teachers have found helpful in clearing their thinking and understanding with a view to teaching evolution in grade 12 FET.

I worked as a molecular biologist for many years before coming into teaching; I am also an ordained minister, so I have tried to put something together drawing from my experience. It does not push one particular view but gives a background into different belief systems and how our belief systems influence the way we interpret scientific data. It also shows the changing nature of knowledge and how DNA and information technologies have increased that knowledge base.

Hope people find this useful.

Blessings SV”

Email sent: 2005/06/27 11:24 AM

This email also required members to be involved in a process of identity formation which is the last indicator to be discussed. The concept of “mutually defining identities” is critical to the formation of a CoP. The formation of shared identities provides a location for the members within a CoP and places them on a trajectory that takes a member from legitimate peripheral participation to the core of the CoP, a place where the deepest learning takes place.

As an illustration of this process one of the members of the focus group belonged to a school that was new to the IEB. He identified himself in terms of a “newby” to the IEB, which was not disputed by the focus group. Identifying himself as a “newby” confirms that identity formation is part of the processes of the BTN, and that it was not disputed points to the mutuality (shared understanding) of the formation of that identity.

Finally, humour was highlighted as important, and the most humorous comment is reserved for a certain members’ disdain for MS WORD:

“I am just not prepared to work in Word – my medical aid could not stand the strain.”

Email sent: 2005/06/14 05:48 AM

4.4.2 Conclusion

All 14 indicators are present in the data. Although some of the indicators are weakly represented in the data, e.g. stability (which could only be measured through the frequency of emails) the evidence reveals a viable and dynamic distributed CoP.

4.5 Analysis of emails using a seven level set of descriptors of teacher reflective practice.

The 250 emails sent and received by the members of the BTN is a rich source of data for the study. In order to establish the quality of the emails a selection was analysed using a seven level set of descriptors of teacher reflection. The sample of emails was drawn from a discussion on the implementation of the FET Grade 10 syllabus.

The implementation of the FET phase of the National Curriculum occurred at the beginning of 2006. A discussion arose between some members of the BTN after a question about suitable FET text books. The interchange was not typical but served as an example of the potential for the BTN to provide a forum for discussion amongst a distributed membership.

The “syllabus debate” emails provides serious anecdotal evidence of the BTN functioning as a CoP and adding value to the enterprise of teaching Biology. The exchange stretched over a period of eight days. Sixteen emails were sent by members and forwarded by myself. Twelve members participated in the exchange with three members posting at least two emails. The emails were analysed using the classification suggested by , as displayed in Table 4 on page 42 . The number of emails per level is recorded in the table below.

Table 5: Classification of email interchange according a seven level set of descriptors of reflection

Reflection Level	<i>Number of Emails</i>
Level 7:	<i>3 emails</i>
Level 6:	<i>1 email</i>
Level 5:	<i>5 emails</i>
Level 4:	<i>2 emails</i>
Level 3:	<i>4 emails</i>
Level 2:	<i>1 email</i>
<i>Level 1:</i>	<i>0 emails</i>

According to the scale of reflection the exchange of emails about the syllabus debate had a high level of functioning. The high level of discussion included at least 10% of the members and provided important information about the implementation of the Grade 10 FET syllabus.

The level 2 email sent on the 7th of September sums up the sentiment of the exchange:

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“I so appreciate all the emailed information that is sent to me. What a wonderful resource. I am sorry that I have not contributed more!” Email sent 7/9/2005

The exchange of emails was also able to provide a context and add to the repertoire of the BTN. It created a shared history of experience, exemplified in one of the three level seven emails that describe the issues around developing new materials and syllabus for the Grade 10 FET implementation.

“Like you, I had been waiting for the government to provide us with a syllabus. But just before the end of last term (Julyish), I received a document from Y. It was a sort of syllabus, i.e. detail added in to the FET content on pages 32-40 of the Life Science NCS⁹ booklet. She told me that it was given by the Publishers’ Association to all people writing textbooks. I emailed X to ask if this was the real thing, i.e. was it the syllabus provided by the government. He replied that it was not, that it was guidelines given out by the publishers’ assn, and that science was writing their own!!!! I discovered later that science made that decision at conference and we had been left in the dark. I was not a chipper chicken - as we have very little time and I have anecdotal evidence that when the 1996 IEB syllabus was designed that it took forever to reach consensus. So, I contacted X and asked if we should be doing our own, and he said yes. We had a meeting the following day, so I reported this back to them, and asked who wanted to work with me on designing one. Email sent 7/9/2005

⁹ National Curriculum Statement: The definitive Government Educational Policy document.

The email had all the elements of a level seven interchange as the events and experiences:

- are described using appropriate pedagogical terms, e.g. “It was a sort of syllabus, i.e. detail added in to the FET content on pages 32-40 of the Life Science NCS¹⁰ booklet”.
- include a rationale that relies upon a principle or theory, e.g. “Life Science NCS”.
- consider contextual factors e.g. “I have anecdotal evidence that when the 1996 IEB syllabus was designed that it took forever to reach consensus”.
- consider contextual ethical, moral or political issues, e.g. “I hope that people don't think that this is very high handed of me or the cluster group”.

This scrutiny of the email exchange about the Grade 10 FET implementation revealed several key aspects of a CoP and a high level of cognitive interaction.

However, the exchange was rare and the bulk of the exchanges were emails about sharing knowledge. While the participants felt that it was important to be part of the exchange on the FET syllabus, a quote from a member of the focus group illustrates that not all the email exchanges are universally embraced:

“.... I can't really be bothered, um and also the people out there panic about syllabus and are constantly exchanging emails about which syllabus is more bobaas (important), generally speaking I am binning that stuff too as well because I know for a fact what ever is bobaas (important) in 2006 will be completely different in 2008 ...”

The response of this member of the focus group illustrates a deeper issue of information overload, but another quote reveals that not all the emails are ignored and also makes a distinction between resources and procedural information:

¹⁰ The National Curriculum Statement or NCS is the National Department of Educations' policy document on the Grade 10 FET phase.

“Ja, I think there have there have been times when it has really helped and I said that to you and I have actually emailed you that response. Um, its helped me a lot with the lower grades, minor worthwhile assignments, being able to pull of a genetic test that’s twice as good as mine and use it immediately, with a printed memo, WOW, that’s a huge blessing for me, from the point of view of workload, but at the level of procedure and forms it can be murky, which one is the authoritative one?”

The classification of the emails according to a scale measuring reflective practice revealed a high level of cognitive interchange. The emails were a selected sample but indicated that the BTN has the potential to facilitate reflective practice.

4.6 Conclusion

The data from the emails and the focus group were complimented by the participant observer status of the researcher. The analysis of two sources of data reinforced the findings from each source and the intersection of the findings contributed to the level of validity and trustworthiness of the data and the subsequent interpretation.

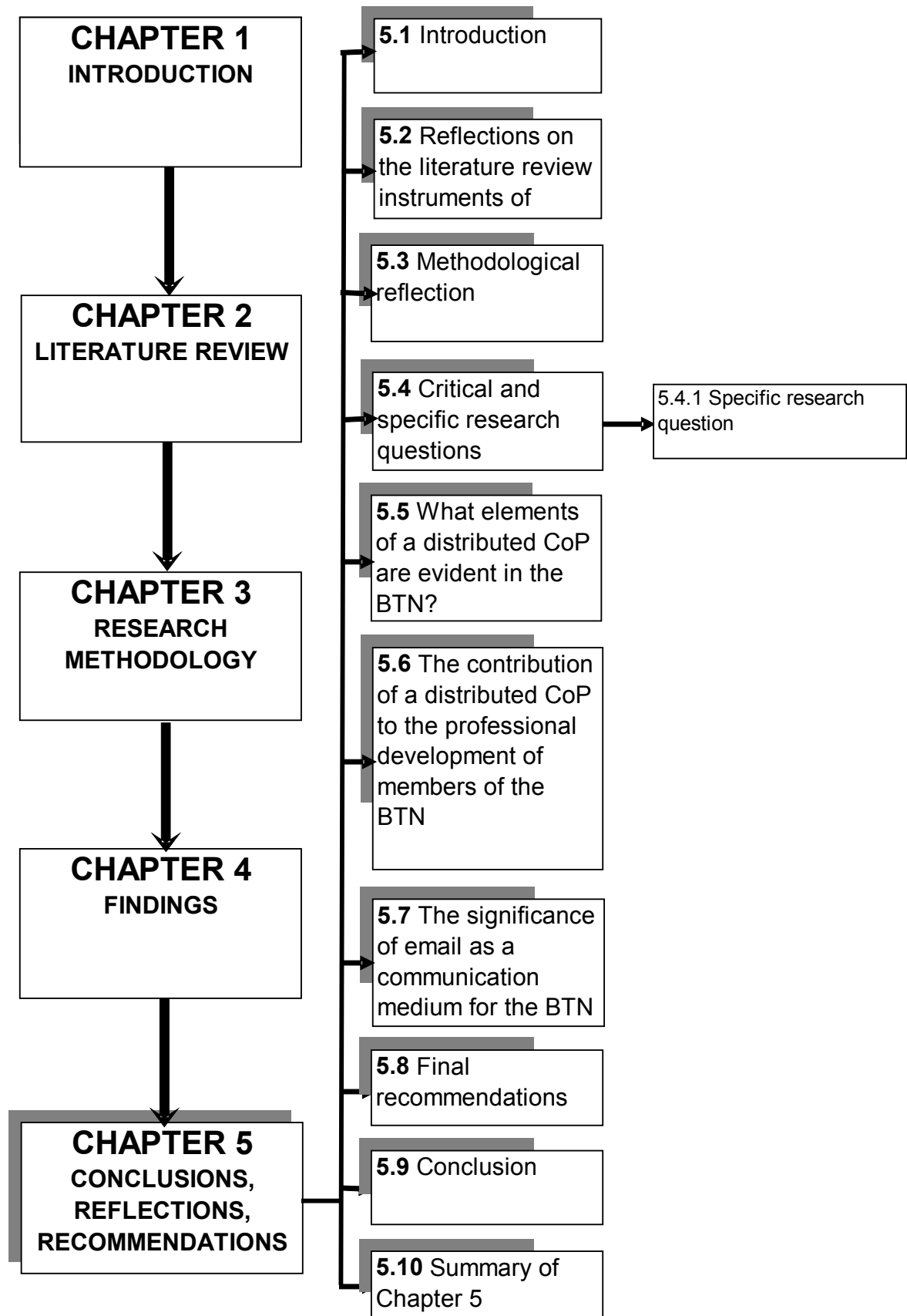
The BTN is a distributed CoP with passionate leadership and a small core of supporters. Most of the interaction is the sharing of information through the attachment of documents. Evidence from the focus group and the email analysis reveal that the process of identity formation is taking place. This occurs through the negotiation of meaning as the members share reified artefacts, e.g. worksheets, website addresses etc. and participation in the form of discussions via email and the annual face-to-face contact at the IEB Biology teachers’ conference.

There was a rich data set describing the BTN and its functions in the context of the theoretical framework of distributed CoPs.

4.7 Summary of Chapter 4

Three analytical tools were used to examine the data from the focus group interview and the email collection. The three analytical tools were a table of 21 structural characteristics of a CoP, a check list of 14 indicators of a CoP and the analysis of the email data against a seven level scale of descriptors that measured the level of reflective practice.

When the three analytical tools were applied to the data, several aspects of a distributed CoP were highlighted. The analysis also revealed deeper aspects of the functioning of a CoP, including the processes of reification and participation resulting in the negotiation of meaning, in turn leading to identity formation.



Chapter 5 Conclusions, reflections, recommendations

5.1 Introduction

In the light of the literature review and the findings, the critical and specific research questions are addressed in Chapter 5. The first section of the chapter is a reflective exercise that creates a link between the findings, literature review, methodology and the conclusions, reflections and recommendations. The second section deals directly with the critical and specific research questions and uses the responses to describe the BTN, suggest further research and provide suggestions for the establishment of educator distributed CoPs within the context of South Africa.

5.2 Reflections on the literature review

Etienne Wenger is the most quoted author with respect to the concept of CoPs . Other authors who contributed valuable thinking and information are Hung and Nichani for their questioning of the concept of an online CoP , and Johnson who pre-empted this line of questioning with a thorough review of the literature of distributed CoPs, concluding that distributed CoPs are viable. The link between KM and CoPs was made by Carroll et al. and the same authors extended the link to include education. Stuckey provided the most comprehensive advice on how to grow and sustain a distributed CoP , and Dubé et al. provided the most comprehensive structural analysis of an online or distributed CoP .

While it is not necessary to highlight all the contributions of all the authors this cluster provides the necessary framework to locate and understand CoPs in order to construct an accurate portrayal of the BTN. The abundance of the literature stands in stark contrast to the lack of published literature on the topic in the context of education in South Africa. The published examples describe the importance of CoPs as a medium for teacher development in South Africa . Their studies attested to the ICT barriers of bandwidth, lack of ICT skills and, in the case of Collie (2005), even access to a telephone. In contrast, the case study of a successful international distributed CoP of educators, MirandaNet, highlighted the role of a simple medium of communication, viz. email .

The literature review constructed a rich and varied landscape to locate the concept of CoPs and distributed CoPs.

5.3 Methodological reflection

The choice of a case study methodology was confirmed as the best format to study the phenomenon of the BTN . From the literature, three instruments were adapted to sift through the data. One instrument was specifically developed to analyse the email data , the second to analyse the BTN against the “21 structuring characteristics of distributed CoP” and the third used the “14 indicators of a CoP” . These three instruments proved more than adequate for identifying the information and evidence needed to answer the research questions.

The result was a rich and organised appraisal of the BTN as a distributed CoP. The research questions, findings, conclusions, reflections and recommendations based on this appraisal are discussed in the next section.

5.4 Critical and specific research questions

The research questions are repeated below:

5.4.1 Specific research question

What perceived events are observable in the phenomenon known as the Biology Teachers Network?

Critical research questions

- What elements of a distributed CoP are evident in the BTN?
- How does a distributed CoP contribute to the professional development of members of the BTN?
- What is the significance of email as a communication medium for the BTN?

Each specific research question will be discussed in turn in order to cover the affective, cognitive and psycho-motor aspects of the BTN.

5.5 *What elements of a distributed CoP are evident in the BTN?*

The term element refers to those basic building blocks necessary for the existence of a distributed CoP. The data provided rich examples of the elements of a distributed CoP.

Demographically, the BTN tends towards the operational and permanent, even though it is still young. The organisational context has a low degree of boundary crossing and operates in a supportive environment that experiences a high degree of organisational slack. The BTN is certainly not institutionalised nor is it unrecognised. The leadership style is one of continuous negotiation but in practice there is a single moderator who is supported by a small core group of passionate supporters. This combination of institutional slack and leadership is an ideal configuration according to Stuckey (2004). The membership is homogenous with over a hundred members representing approximately a hundred schools. The members are geographically dispersed, membership selection is open, and most significantly, voluntary. Despite the members of the BTN not having much prior experience of distributed CoPs, a significant membership developed. At inception of the BTN, the members had low levels of ICT skills but these increased over time.

In addition to these structural elements certain other key elements of the affective domain were identified as being present in the BTN. These elements are softer than those listed above and describe a distributed CoP that is vibrant and dynamic.

The BTN has the characteristics of a CoP in the “coalescing stage” . At the time of research the CoP members exhibited shared mutual relationships and ways of doing things. This resulted in the flow of information leading to problem solving through the process of negotiation of meaning and legitimate peripheral participation. The process of negotiation of meaning is exhibited in the levels of participation and the reification process of sharing artefacts e.g. worksheets. Through the email interactions a shared repertoire developed, characterised by the use of jargon, acronyms and ultimately a shared discourse that has place for a sense of humour.

From a structural and implicit point of view, all the elements necessary for a vibrant and dynamic CoP, are present in the BTN.

5.6 The contribution of a distributed CoP to the professional development of members of the BTN

The need for professional development of South African educators was established, especially in the light of research that shows that it is teachers who have the most influence on the success of a learner. Evidence from the data revealed that the members of the BTN benefited from the sharing of documents, website addresses and discussions, e.g. about textbooks and FET implementation. A knowledge repository (a CD-ROM of resources) was developed, but the distribution of the CD-ROM relied on an annual face-to-face meeting (conference) of the bulk of the members.

The BTN acted as a communication bridge between the annual IEB Biology teachers’ conferences and regional cluster meetings. It promoted collegiality through exposing members to each others’ knowledge and identified the “experts” in the distributed community. A greater culture of sharing formed, breaking down the isolation common to the teaching experience.

A significant number of the members did not contribute and to test whether the process of legitimate peripheral participation of members was on an inbound trajectory would require a longitudinal study of the BTN.

A snag was that the emails from the BTN increased the information overload experienced by teachers. This contradiction of isolation and information overload deserves further research as it could be that the information overload is a factor exacerbating isolation.

The members of the BTN benefited from the increased interaction with colleagues which lead to increased levels of professionalism. Membership of the BTN contributed to the cognitive domain of the human experience.

5.7 The significance of email as a communication medium for the BTN

Email is the primary means of communication in the BTN. It seems contradictory that in the Internet age, where the facilities for hosting websites, online discussions and even video conferencing are more readily available than ever, the BTN resorts to email and attachments.

In light of the data analysis, the choice of a manually operated email system is not a retrogressive step but, in the case of the BTN, a sensible and suitable arrangement. The advantage of email is that the information arrives in the recipient's inbox without the member having to log on to a website to see if there is new material that can be of use. The downside of the lack of a current knowledge repository is ameliorated by the reification of the shared information using the commonly understood medium of a CD-ROM.

As discussed earlier, participating in the BTN resulted in an increase in the ITC skills of the members and it is conceivable that in the near future there would be a significant core of members who would use a website as a knowledge repository in conjunction with the manually based emailing. The analysis of the data showed that most of the emails were used for information sharing. Discussions of a high cognitive level using email are possible, but interestingly the data revealed only one example.

With respect to ICT skills a contradiction emerged as the members had low ICT skills, but operated in relatively rich technological environments and relied on ICT to

complete some of the necessary tasks for their work. A significant benefit was that when members learned new ICT skills through the emails of the BTN they were able to adapt as they were not dealing with outdated ICT equipment. They had access to ICT support and there was evidence that some members drew on this resource.

Email proved to be an effective means of communication and vehicle for the informal professional development of the members of the BTN.

5.8 Final recommendations

The discussion of the data analysis revealed that the BTN is a successful distributed CoP with all the necessary elements of a CoP. It also showed that it functions as vehicle for professional development and that the medium of email is an adequate form of communication. As a result, the members of the BTN experienced a professionally supportive and stimulating, if low key, distributed CoP.

The research of the phenomenon of a distributed CoP of Biology teachers in South Africa provides for a possible strategy of implementation of CoPs that can lead to increased levels of professionalism and ICT skills amongst the participants. These recommendations are in alignment with the White Paper on e-education which makes reference to the increase in the use of email but also the limitations of using the Internet due to the “inadequate technical and pedagogical support at the local level” .

A set of guidelines for the establishment of a distributed CoP in South Africa fundamentally inform the recommendations drawn from the research in this study.

- The provision of an environment with computers that are connected to the Internet is a prerequisite for the formation of a distributed CoP. While low bandwidth can limit the purpose of the CoP it does not preclude functionality.
- The distributed CoP must be initiated and coordinated by a passionate individual who is supported by a core of passionate members. The individual must be prepared to spend a small part of the day forwarding emails from members, rewriting the subject line for clarity, promoting a culture of sharing and providing some technical support.
- Institutional endorsement and support is not necessary. If institutional support is provided it must be targeted and kept to a minimum.
- As a communication medium, email, is adequate and ideal for a membership that is relatively unsophisticated in terms of ICT skills.
- The members of the distributed CoP should be afforded the opportunity of meeting face-to-face once a year, but if that is not possible at least the core members should make physical contact.
- A knowledge repository in the form of a CD-ROM is a possible means to reify the knowledge gained from the interactions of the CoP.

5.9 Conclusion

In the affective domain, the experience of the teachers of the BTN is positive. The use of email and attaching documents has proved to be a technologically simple and appropriate method of communication. Despite the low level of ICT skills representing the psycho-motor domain, all the elements of a distributed CoP are present and the potential for growth is firmly established. The cognitive domain is well represented and the members gained professionally.

The theory of CoPs provided the theoretical framework to research, analyse and understand the phenomenon of the BTN as a distributed CoP of Biology teachers in South Africa. A list of recommendations, linked to the context of South African education, provides advice for the set up of a network similar to the BTN.

5.10 Summary of Chapter 5

The chapter summarises the findings from the data analysis and answers the critical research question by addressing each of the specific research questions. The data analysis confirms that all the elements of a distributed CoP are present, and that the BTN is a well-established distributed CoP that promotes the professional development of its membership.

The research revealed that some members of the BTN had a positive and engaging experiencing as participants of the BTN and that the simplicity of the email facilitated the functioning and sustainability of the BTN.

From the data analysis a set of recommendations are listed to provide guidance for the establishment of further networks similar to the BTN. The issue of information overload and the formal evaluation of ICT skill levels amongst teachers belonging to CoPs are suggested as areas of further research.

Chapter 6References and Addenda

6.1 *References*

6.2 Addendum 1: Transcript of Focus Group Interview

R: Thanks, thanks for doing this, basically it is for my research, on the Biology Teachers Network or BTN as I now call it so I do not have to write it out the all the time. And um, there's, there's, what I have to say beforehand that um, its um in terms of confidentiality I am not going to ever refer to you as J from R-school said this

J: So I am not going to get any fame out of this are we?

Laughter

R: No no fame, and also I have to say this as well, you are here because you want to be here, is that right (laughter).

D: you should take that gun out of

R: um as you know the history of it was that I opened my mouth at a conference the one year and decided that this was a good idea. But I just, um, ja just, just, I want honesty and contributions. This is just a kind of a, I am looking for things, no not looking for things, I am just exploring this whole idea, basically that is what my whole thesis is about, just exploring the idea of this whole thing. But it's because its internet related and I am doing a Masters in Computers and Education. OK um can you um, can you first recall when you first heard of the BioTeachers Network? When did the idea sort of first come into your frame of reference? All of you have received emails, but can kind of remember when.....?

J: I think it was my first year of being here. I taught when was it 2001, I came halfway through so beginning of 2002, was when I think it was, that's when got , we had some meetings where the idea was put out, where we started sharing, I think it was 2002.

P: In my case, when, it was at the first user group conference in 2004, where you shared that it was available.

R: The user group conference? At the Regional user group or the....

P: The big one

R: Okay, ja

J: I think it, I think it started out as lot smaller and then you began to suddenly blossom and that was obviously a bit later on.

R: Ja, D?

D: It was similar for me because we came to this meeting or a similar cluster group meeting, we were moderating and that's where you mentioned it.

R: Okay

D: Otherwise I really became aware of it at the user group conference.

J: Actually my dates are wrong as I am missing out that I went to C-school

R: Did you get emails at C-school

J: No, no what I am saying is that I went to C-school and I actually taken that out so it wasn't 2002 it must have been 2004

R: Ja, you took my job

J: What you mean, at C-school.

R: JA

J: Where you there

R: No I applied for that job you took

J: Ja, that's right

R: and I went to B-school

J: That's right

R: But I got offered it before you, of course I must have been offered it before you and on the same day I was offered the job at B-school and then I was like, because I really wanted to work with DC and my gut feeling was that he, he didn't say anything, but I thought, no, DC's not going to be around. Anyway that's another story.

R: Okay, um a very open ended question, can you describe some of your responses and reactions to emails that you have received or um sent. If you have sent emails, not everyone sends What's your reaction when you see one of those emails popping up in your in your in your inbox, from Rob, you'll see it comes from me, does come up from me

J: Ja it does, well sometimes I defer it because sometimes they are things that I know that I am going to have to spend time thinking about. So I know, I know in the course of a busy day, it's often it isn't usually a one liner from you. It's normally going to include an attachment, it's got, some exemplars, or some documents or something I am going to think through. Its, its fine if I can see that it says in the subject line that its just like, for instance, notification of like a conference, then I quickly scan and see that its for Joburg then fine, but the moment I get the feeling its an exam or exemplar then I leave it for later, obviously PDFs take a long time to read. But I look forward to getting them I don't mind them at all.

D: My response is very similar because in our school we speak to each other with email, I mean people don't phone each other, something happens, so you don't have lots of time to read your emails, (inaudible patch) so you know I do look at it, I do see ,you whenever you send, and its good to have it. And sometimes its messages between, I remember one it was message from that person to that person; I don't know half the people so...ja.

P: In my case, I've got Linux so I can't read any of the attachments, so I have to forward on, I scan the list on my PC and if it is an announcement that I can read on the email itself, the I read it and then delete it and if its got an attachment and I think it might be useful to me then I forward it on to my home address and then have the leisure to read and print it if I need it there, if it's a website link usually I dump it unless it really piques my interest immediately then I dump it. Um the few times that it has piqued my interest it's been a huge blessing. I have downloaded whole PowerPoint shows as are from the net but it really has to be something that interests me if I am to pursue that link otherwise I dump them. It's only really the links and the interpersonal interchanges that I delete straightaway the other stuff I forward

J: What I've done with the links is, whenever, I've actually opened up a word file and whenever there's a link I actually copy it straight out and dump it into that word file. So now I have one page of Word that just got, just got links and usually people like Jenny will say I found this interesting site on genetics and I copy with it. So its not only the link but actually the preamble to the link, and its all in one place and then when we like hit exams and I have time, then I'll open up that page and say right lets go through these things and see what they really at.

R: Ja, ja, the ja (turning to D) when you said that everybody talks on email, so I mean, what's, you must um get hundreds of emails.

D: Ja, that's the problem, and that's why you don't have lots of time, to go and explore, to see, you want to be able to see exactly what it's about, would it be, phrases, you know worth looking into.

R: So you say that...

D: Deciding if it's important or not, one must decide

P: Sometimes its confusing a little bit because you, I, as a newbie in the IEB have no idea which grid I am going to nee for what, on top of that, I am an outcomes based beauracracy sceptic, so If I get forms that I got to fill in, generally I am binning them, unless it says there, P if you don't have this form for your grade 12 CTA you are dead

(laughter)

You know that type of thing, because I can't really be bothered um and also the people out there panic about syllabus and are constantly exchanging emails about which syllabus is more bobaas, generally speaking I am binning that stuff too as well because I know for a fact what ever is bobaas in 2006 will be completely different in 2008, necessitating that our, my decision for next year and my new staff member is going to bring internal syllabus stability to E-school, regardless what happens with WCED and IEB, there needs to be an element of internal stability, so I just don't see it as being stable.

R: Ja

P: and I also don't know which source is authoritative

R: Okay

P: which is a real problem for me, like you sending me this website has published new guidelines for this, now do I need to look at those, is looking at them going to just make me more confused

R: Ja I know

P: do I bin them, if I bin them, is J going to be cross with me

(laughter)

J: like the biggest oke I the cluster is scared of the smallest oke

P: So that's what I am saying there's a whole lot of that going on

R: So you touched on something, you said as a newbie, can you imagine what it would be, well I am trying not to lead the question but, if there hadn't been something like the Bio Teachers Network, you know 5, 4, 3 years ago, there was nothing like that, there was no kind of internet exchange, um, if you came in as a teacher then, what do you think your experience would have been, How different would it have been?

P: Ja, I think there have there have been times when it has really helped and I said that to you and I have actually emailed you that response. Um its helped me a lot with the lower grades, minor worthwhile assignments, being able to pull of a genetic test that's twice as good as mine and use it immediately, with a printed memo, WOW, that's a huge blessing for me, from the point of view of workload, but at the level of procedure and forms it can be murky, which one is the authoritative one.

R: Okay, um the other thing is, just now, um K when she left, she said oh it's good that we have these cluster meetings, because we get so isolated, now I want to read

you a quote and then you can just bounce some ideas of this quote. It says:
Educators are Islands of Excellence, with no ferry service to connect them, to each other or too groups of their peers. I'll read it again; Educators are Islands of Excellence, with no ferry service to connect them, to each other or too groups of their peers. What does that

J: I think we are largely all too busy to make face to face contact with people outside of your school, I mean you guys I see four times a year, and I never phone you in-between, its not to say that I wouldn't like to, I find these meetings always incredibly valuable, because you always sit down, there are certain things, you can only do face to face, they are incredibly valuable to do that, but when you can do that, you are an island essentially, and I think what you, what what your service is offering, it makes you, it makes you an island that gets provisions, in other words you are not really like a um, watch you call it, (castaway) like a um sole survivor, you are not like a castaway anymore, which is what you could be like, and certainly people have been like, you now are like a, like a castaway but you are getting provisions in and and its up you to obviously choose to decide what you are going to use and how you want to use it, but it is there and if you ever feeling like a castaway, you just send an email and you'll get a responses back, so I think, I think how well it works for you depends on how much you are willing to also get involved in this.

R: mmm

P: Ja I am also am tempted to say that, I can't say it much better than that, except to add that I think we also sometimes we are quick to underrate the amiability of these meetings, but I mean I've had, you know, my usual stress syndrome going on all week about this one and yet when I get here and um, and um its great and its collaborative and I learn, you know I find it, and its great and I walk away from it wondering what I was worried about, and I sometimes wonder if we don't as a Biology cluster underrate the warmth of the people that happen to make up the cluster, we don't have interpersonal issues, I think that's a huge blessing, one that we underrate very very easily, I think if we brought this whole group together for a braai, it would be amiable and fun. The cast away thing and the box bobbing on the beach is a great illustration of what the network is doing, I think that's a very nice visual image, and also my only argument is with the labelling of the really important boxes. (laughter in the background)

R: You have to open them to find out what's going on, what about some red boxes

P: I don't need chewing gum

J: I think if there was one major improvement that I could say it's that, that subject line is actually a vital thing, the subject line actually needs to be very particular with what's in that thing. That I think, well obviously you get a lot of these things you send them out and you just put a thing in the subject line that alludes to what's in there. I know for myself, if you had to spend another minute just working out exactly what that thing is all about it would also help me when I open up, because I never delete your emails, unless it's just stuff, I have another inbox or sub box saying its Biology and all your stuff, once I have read it and I've used it just goes in there, if I go back there 6 months later and I look at the subject lines, now which one was it, then they all begin to merge because they are all quite similar, whereas if you were more particular about what was in there I could actually identify from the actual subject line.

P: I would like your subject line to start off by saying, something like um,

R: BTN email or.....

P: No, no, no I would like it to start off

J: like policy

P: that's right, policy, curriculum, curric, whatever and then if something is mandatory, maybe then mandatory need to be a, a, a thing, if it says mandatory, I am on it like a vulture

R: Especially for P

J: Yes P, dead

P: ja, (inaudible) once can play with it you can have dead, if it says dead I know, look, if I don't. I mean I found a mail from on your network yesterday from A and, cause I had done what you did, except I hadn't had time to read Rob's thing so there was a whole full on list of these things unread and I got a bit of open space, and I was working through, and there's one from A saying, don't deduct for the histogram on the CTA, well that's going to mean that I am going to have to go and back and mark my guys because I nailed them all for the histogram. They all used a line graph

J: Which it was meant to be

P: I didn't know it was in that set, I just left it untouched, If I had know it was there, if it had said "dead" I might have picked it up earlier

D: It should have been emailed in another way to the school

J: Your head of academics meant to have given it to you, cause it arrived as an email

R: It went through the IEB as well

R: Now it is interesting that you used A's name, now do you think, again, try kind of imagine a world (laughter) without the Bio Teachers Network, would you have known who A was, I mean I guess.....

P: I would have he was at Varsity with me, but, but....

R: Ja okay so there is a personal connection, but.....well

J: No, it certainly helped me to get to know, well I mean I've met JP, AP, whose names now roll of my tongue, like I know them well, I have only met them once or twice and I have seen them I have only seen them at marking and I and I've seen them at conference, but from that I would never have begun to realise, just what incredible work they are doing and what incredible research they are doing. And I mean the stuff they are sending out, so I am, if you say to me now James, we need to do something to do with genetics then I am going say get hold of, get hold of...

R: J or

J: get hold of JP, because like boy o boy she knows her stuff. I have only got that from your network

R: D?

D: Ahh (then silence)

R: Anything, I am just trying to give you a space

D: No, No Don't fell sorry for me I am listening, ja no it's fine

R: The um, we are near the end by the way, um this is, mm thanks. The, Well this is a kind of open question as well, have you had any other experiences with groups where you communicated via internet, and belonged to professional groups or hobby group or something like that, where you've had experience

J: No, none whatsoever

D: No, this is the first one and that's why it's unique in that way, you know to ask us to belong to this kind of group, it's the first time and I think that's quite good.

R: Ja

D: Cause, I mean, half these people like I said, I don't know them, we have one thing in common and that's that Biology

R: Yes

D: and that's quite good, you know

R: And does it ...P you want to say something?

P: No, no I would agree with that, It's my first one but it's also, it's generally speaking a pleasure

D and J: mmm

R: And the um, one of the things I tried earlier at the beginning, was a, was a yahoo based one, where you became part of a, and I'm part of a couple of these, but, basically its its, you sign up to yahoo and then yahoo, instead of me forwarding the emails, yahoo forwards the emails, and, none of you belong to anything like that?

P: No

D: No

J: I tried to sign up with that

R: Please move your hand

J: ja, sorry I tried to sign up for yours, but I never managed to get on it and make it work so yours is working fine

R: Ja

P: Ja, I agree with that, your systems better than that system and I wouldn't use a system where I had to log on and go to a site

J: Mmm, I wouldn't either, I wouldn't log onto a page

P: I wouldn't

R: Why not?

P: takes too much time

J: Its one extra step and the point is with email it tells me when something's arrived, I am not going to go opening up a site to see if something has arrived

D: (agrees)

J: It's a las

D: Also with our network and it depends you know on what time of the day you can go to that site

P: I know at E-school the firewall is so ugly that you know maybe they won't even let me on; they don't allow us onto Yahoo anyway so

R: Ja, well that's ja...

J: But for me the most important is I don't like looking to see if there is something, it, it. I must be notified when is something there for me, that's why I think the IEB website, none of us, I think,

D: I don't

J: use the IEB website, because, because, you only want to go there when something's new

R: But you never know

J: You never know when something's new, so you know to keep on checking, who's going to do that?

D: There is a teacher at my school that does that...but

J: Well I can see M does as well, well hats off, fantastic, good for you, I can't do that

P: I can't either

J: I only attend to t....

P: and I don't want to, I mean fundamentally I don't want to, I don't want to run around after someone else's website, where I've got to check and the I've got to enter a password, and then I don't know the password

J: and it's always WZT4 (laughter)

P: and then I look it up and in my admin system that means hours of searching for the piece of paper

D: yes it mustn't be that cumbersome, but I want to say thank you for doing this because it's an excellent, I mean it's obviously your time

R: mm, mmm

D: and energy and stuff

R: I can ask one more question just to round off, just to finish.

D: yes

R: We have, we have cluster meetings, we have the conference and I think we kind of answered this, so what's the point of having an email network if we see each other

D: We only see each other once, what or three times in a year maximum

J: We only see each other 3 times a year and also and also

R: You have colleagues who support you at school and that kind of thing

J: No but it's not the same, because you've got one or two colleagues but you

P: If you are lucky

J: If you're lucky, sometimes you don't, but also you don't necessarily have experts or you can have contact with other experts, I consider M an expert, so having contact with her provides me with extra stuff that I wouldn't necessarily get here, and hopefully from like also some other people, so also glean things from me, so you meet up with people who can support you sometimes with more than what you got

R: mmm What, what, ja that's fine

J: I am not sure; I have actually forgotten what the question was

Laughter

D: Why we needed conference

P: For me as well it's an instant solution and for me that's very important. I don't have the, especially me running SDR in parallel to my career, I don't have the time to dither around. If I have looked through my genetics file and I don't like the test I got and I want a new one, um the fastest way to get it is to email you and to say...you know what's going on and that email goes out...half an hour later I have got one from JP and I'm sorted. Um, and then I ah, I rarely send stuff back and hopefully the stuff I send back, there is someone out there who is prepared to be as quirky as me and will use some of my stuff, so the thing is for me its instant support, it means I can deal with my problem now, not next week, not in two weeks time.

J: Also I I it's a las if you want something from me, it's a las for me to say okay, ja rob fine, ja, I will get it for you, because ah flip the print rooms closed now, so sorry it I will have to give it to you the next time I see you, geez when am I coming out to Franschoek, no I am not sure when. Now if you want I say: "Sure first thing on Monday, I will email you and email with the document, cause its saved

D: Ja, that's right, I find that continuity after the conference

J: It's just

D: for example, still if people needed to get hold of things, after the conference

P: I also found your disc, just as a different expression of way of, expression the BTN. The conference by conference disc expression is exceptionally helpful.

D: Mmmm, I agree

P: I mean the PowerPoint shows that were on that disc that was issued, aah, you know, I virtually, I have used several of them

R: Mmm

P: and they've been great and I have translated several of them across into mobile... and we will use them for underprivileged schools and that type of thing, I mean also, different expression of the BTN but equally valuable.

R: Mmm, well that's great, thank, that's a good couple of hours of analysing and coding that we have to do.

J: It's a pleasure doctor in training

D; yes

R: thanks very much

6.3 Addendum 2: Analysis of Purposeful Sample of Emails

University of Pretoria– McKay, R. (2007)

Sender	Date	Content	L e v e l
JB1	2005/09/06 10:47 AM	Hi RM A question. Apart from the references to FET content on pages 32-40 of the Life Science NCS booklet, is anyone aware of any more official, detailed descriptions of content that I should be aware of. We too are going grey trying to decide on text books - each set of authors seem to have their own spin of what to cover ... and the depth that should be covered. At the moment therefore it looks like we're going to do our own material. Please distribute. Thanks JB1	5
SD	2005/09/07 06:36	We are writing our own material for the first year. During this year we will evaluate all new textbooks and make a decision for 2007. SD	3
MG	2005/09/07 09:12	Dear RM I have gone through all the sample books that have been sent and we have decided on the following syllabus (see attached document)to follow for Grade 10 FET. In the attached document you will see that there is a column showing where the content is presently being taught and the bolded writing indicates new work that must be covered. WE have decided on issuing "Life Sciences for the classroom" by Avis, Dawson and Heese. Publishers: Heinemann as it is a book with lots of exercises and little content. This gives us an opportunity to provide content to the pupils (making sure that we are still needed in the classroom!) and then applying knowledge etc.. with the activities in the book. WE realize that if this is not the best book that we will change it for the following year REgards	5
LB	2005/09/07 09:57	There is a resource document, based on what was given to the textbook writers, in its final stages of proof-reading which should soon be distributed on this group for comment. This suggests the content and depth for each section. LB	3
LB	2005/09/07 10:03	Another great thing about the mind action series is that you can get them	3

Abstract

The Biology Teachers Network exhibits all the elements of a distributed Community of Practice. Legitimate peripheral participation, negotiation of meaning through participation and reification of the shared discourse are evident in the sharing of information, collective problem solving and interactions of a high cognitive level. As a result, the levels of professionalism have increased amongst the members, as have the Information and Communication Technology (ICT) skills. The network is dependant on the passionate leadership of a coordinator supported by a core group of members. It is unique as a manually operated, email-based system suited to an environment where the members have low ICT skills but have access to a computer and an Internet connection. The research suggests that this model of distributed CoPs may be a strategy for teacher professional development in South Africa.

Acknowledgements

The first thanks goes to my family: Claire, Dylan and Lucy who not only spent many hours without their partner and father but had to endure my chaotic work patterns and lapses of self-confidence. Dr. Pam Miller took on the responsibility of organising the offering of the Masters in Computer Integrated Education in Cape Town. I want to thank her as I benefited immensely from her initiative. I also want to thank her for opening her house (dogs and all) and heart to your students. I was exposed to a wonderful and inspiring group of classmates, who I must thank for the faith they put in me by electing me the first tea boy of the class, and to the remarkable and vibrant energy wrapped up in the persona of Professor Johannes Cronjé. I want to thank Professor Cronjé for his inspiration and energy, which, even though he was in Tshwane, traversed the vast tracts of our incredible country. Finally to my colleagues of the Biology Teachers' Network who are continually willing to innovate.

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Summary

This study researches phenomenon of the Biology Teachers Network (BTN), a distributed Community of Practice (CoP). The membership of the BTN is voluntary. The BTN is supported by a core group of members and administered by single moderator. The network uses a manually operated email system to communicate and share information as an automatic listserv proved to be beyond the capabilities of the membership.

Etienne Wenger is the authority on the theory of CoPs and provides in depth background to the processes that are evident in a CoP. A CoP consists of the Domain, Practice and Community and through a process of negotiation of meaning, learning takes place through identity formation. CoPs can exist online in the form of distribute CoPs. Passionate leadership is essential for the formation of a CoP as is the voluntary participation of the members.

A Naturalistic case study methodology is considered to be the most appropriate research tool. In this study a focus group interview and a collection of emails were used as data sources. The data was analysed using three instruments derived from the literature.

The conclusion from the analysis of the data was that the BTN is a vibrant and fully functional distributed CoP in the coalescing stage. Participation in the BTN has led to an increase in professional development and ICT skills amongst some of the member teachers. The fact that this was achieved through the use of email instead of sophisticated websites suggests that this model of distributed CoP is suitable for the professional development of teachers in South Africa.

Key Words

Distributed Communities of Practice

Teacher Professional Development

Email

Internet

Knowledge Management

Life Science

Virtual Communities

Negotiation of Meaning

Legitimate Peripheral Participation

Identity Formation

Ethics Clearance Form



UNIVERSITY OF PRETORIA

FACULTY OF EDUCATION

RESEARCH ETHICS COMMITTEE

CLEARANCE CERTIFICATE

DEGREE AND PROJECT

INVESTIGATOR(S)

DEPARTMENT

DATE CONSIDERED

DECISION OF THE COMMITTEE

CLEARANCE NUMBER :

CS06/09/08

M.Ed (Computer Integrated Education)

A case study of an internet mediated community of practice of life science teachers.

Robert McKay - 25351550

Curriculum Studies

21 November 2006

APPROVED

This ethical clearance is valid for *years and may be renewed upon application*

CHAIRPERSON OF ETHICS COMMITTEE

Dr S Human-Vogel

A handwritten signature in black ink, appearing to read 'S Human-Vogel'.

DATE

21 November 2006

CC

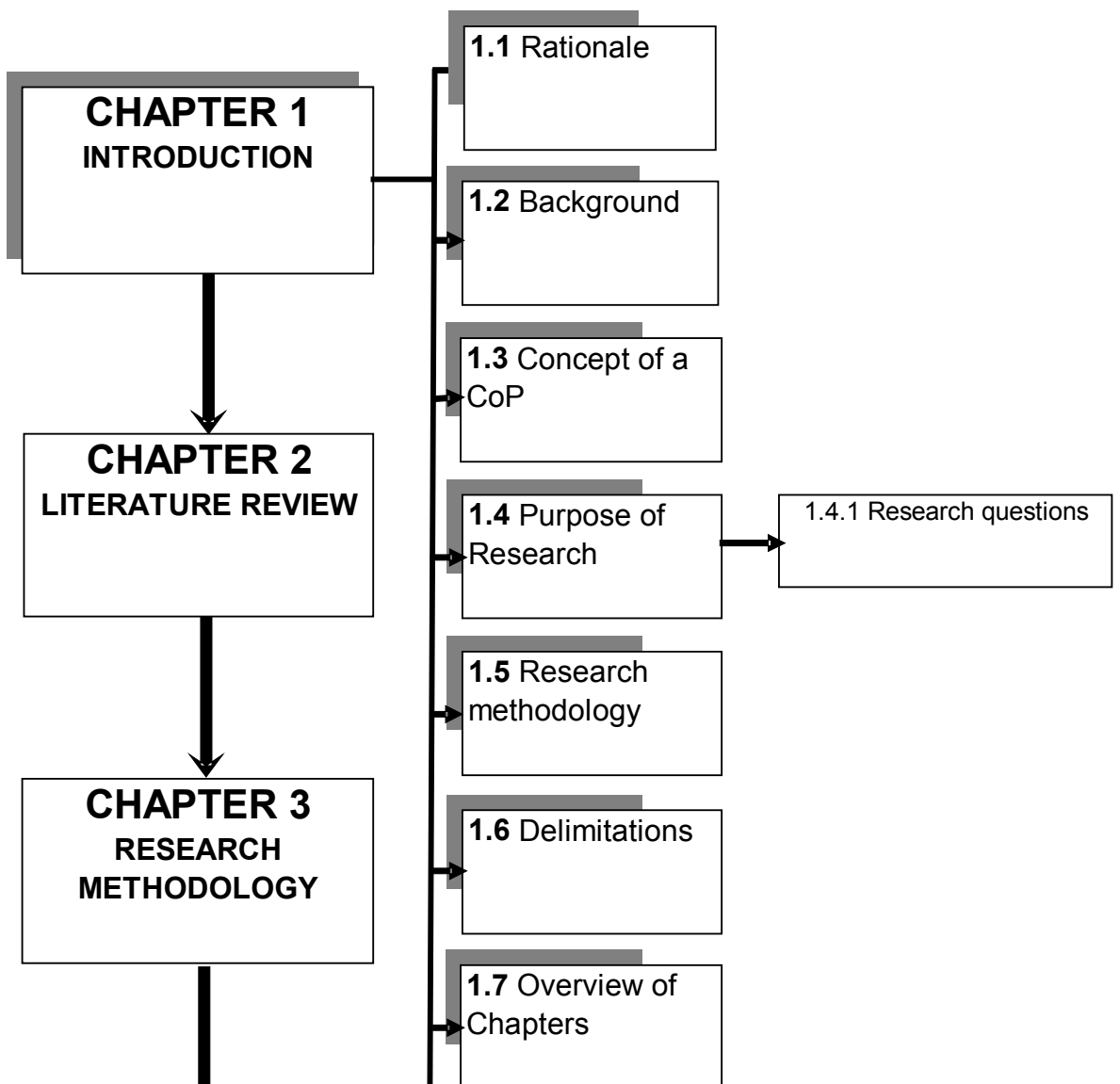
Ms Jeannie Beukes
Prof J C Cronje

This ethical clearance certificate is issued subject to the following conditions:

1. A signed personal declaration of responsibility
2. If the research question changes significantly so as to alter the nature of the study, a new application for ethical clearance must be submitted
3. It remains the students' responsibility to ensure that all the necessary forms for informed consent are kept for future queries.

Please quote the clearance number in all enquiries.

X



Chapter 1 Introduction

The purpose of this study is to investigate the phenomenon of a distributed Community of Practice (CoP) known as the Biology Teachers' Network (BTN). The concept of Communities of Practice (CoPs)¹ was originated by Etienne Wenger and Jean Lave. Lave and Wenger originally studied the learning that takes place in an apprenticeship model. From their research they coined the term legitimate peripheral participation and they also introduced the concepts of identity formation and community of practice. The concept of a CoP is applied to many areas of expertise, including education.

With the advent of the Internet the concept of a CoP has expanded to include distributed CoPs. These are CoPs that use the Internet in varying proportions to facilitate their function. Johnson (2001) researched several types of distributed CoPs while Stuckey and Hung provided advice on how to structure and sustain distributed CoPs. The researchers focused on distributed CoPs that used listservs and websites as the main source of Internet support. The unique characteristic of the BTN is that it is a manually operated, email-based distributed CoP.

The BTN membership consists primarily of teachers at secondary schools that administer the Independent Examination Board² (IEB) exam. The fact that the BTN is situated in the South African context suggests that this form of distributed CoP might be better suited to the unique challenges posed by the South African educational context of under resourced schools, low Information and Communication Technology (ICT) skills amongst teachers and large classes.

¹ The acronym CoPs was selected to indicate the plural form, i.e. Communities of Practice, versus the singular form, CoP for Community of Practice.

² The Independent Examination Board administers the grade 12 examinations for many Independent (Private) Schools in South Africa.

This study provides a rich description of the BTN against the backdrop of the broader notion of distributed CoPs. As the Internet becomes more widely available in South Africa, the formation of distributed CoPs will be critical for developing the professionalism of the teaching corp. Through describing the phenomenon of the BTN this research aims to identify factors that can promote the formation and sustainability of distributed CoPs in South Africa.

1.1 Rationale

The knowledge gained from this study will provide concrete advice on how to implement and sustain a distributed CoP. The unique nature of the BTN (manual-based email system) is a model of a distributed CoP that might be successful in the South African context of schools that have few computers, dial up access and staff with limited ICT skills.

The Internet has become a very successful vehicle for the sharing of information. Electronic information is more versatile than hardcopy as it can be altered to suit the context and needs of the user. A distributed CoP such as the BTN has the potential to facilitate professional growth through the sharing of information such as worksheets, tests, images, website addresses (URLs), professional advice and discussion. A distributed CoP provides a link that keeps professionals, in this case Biology educators, in touch with one another.

In the broader context of South Africa this research is necessary as the South African Government White Paper on e-education promotes technology as an approach to boost the performance and professionalism of educators. The paper states that: “e-Education will connect learners and teachers to better information, ideas and one another via effective means of pedagogy and technology” . The Government of South Africa views technology as one of the solutions for improving education in South Africa, and distributed CoPs could provide the support (both emotional and material) for teachers to carry out their jobs more effectively.

1.2 Background

I am the sole Biology teacher at a small independent school that writes the IEB national examinations. At the 2004 national conference of IEB Secondary School Biology Teachers, I proposed that interested colleagues join a Yahoo user group in order to facilitate the sharing of electronic resources. Of the 150 delegates at the conference only six registered. It was apparent that at that time the Yahoo website was unsuitable for information sharing. The alternative route was to use simple and familiar technology.

At the 2005 IEB Biology³ Teachers' conference, I organised the burning of copies of compact discs (CD-ROM) that had electronic versions of the 2003 and 2004 IEB Matriculation Biology exam papers. I also asked delegates to bring electronic versions of their resources to add to the CD-ROM and five people contributed. I recruited members for the Biology Teachers' Network by asking interested teachers to send me an email. Several teachers responded and currently 104 teachers belong to the network.

The BTN functions as a manually operated electronic mailing list. The members send an email to me and I forward it to the group. I have the role of coordinator and facilitator of the BTN. Virtually all the emails are sent out unedited, except for the subject line which always begins with the heading, BTN, followed by a subject description.

³ South African education has undergone significant restructuring and the subject of Biology is now known as the Life Science learning area. The terms are used interchangeably in the study.

1.3 Concept of a CoP

The concept of a CoP was introduced to me in a conversation with a colleague. The concept of CoPs emerged in the 1990's through the seminal work of Etienne Wenger. The theory and practice of CoPs was encapsulated in the book "Communities of Practice" . Etienne Wenger provides a powerful framework for understanding, describing and analysing this form of knowing and learning.

In 1998 the Internet was becoming a vehicle of communication for CoPs and this study uses the term distributed CoPs to portray the phenomena of CoPs that use the Internet.

1.4 Purpose of this study

The Biology Teachers' Network was established in 2004 and has functioned for three years. This should be enough time for a CoP to emerge and accumulate an assortment of experiences, exchanges, representations, jargon, mutual relationships, etc. The purpose of this research is to uncover and describe the phenomenon of the BTN.

The literature review reveals only a few examples of South African distributed CoPs serving secondary school teachers. They are web-based and the emails are sent automatically, not manually as in the BTN. It will be argued that distributed CoPs can contribute to the professional development of teachers in South Africa and that a manually operated (versus and automated) system of emailing can be successful in the South African educational context.

The research questions were designed with this in mind and are discussed in detail in the sub-sections below.

1.4.1 Research questions

The critical research question summarises the focus of interest as:

- What perceived events are observable in the phenomenon known as the Biology Teachers Network?

In order to address the critical research question the problem is further refined into three specific questions that address the affective, cognitive, and psycho-motor aspects of the BTN. The first is:

- What elements of a distributed CoP are evident in the BTN?

To answer the critical research question about the experience of teachers participating in the BTN, the theoretical and practical framework of the BTN is described. The identification of the elements of a distributed CoP is crucial to providing a background for understanding the affective domain i.e. the human experience.

The second specific question relates to professional development and the cognitive domain.

- How does a distributed CoP contribute to professional development of members of the BTN?

The choice of this question was motivated by the fact that the BTN is an information sharing network and as such can lead to the breakdown of isolation experienced by teachers as well as contribute to their professional development. As the coordinator of the BTN I have noticed that the information sharing was contributing to an increase in the skills and professional development of teachers subscribing to the BTN. This question highlights the cognitive domain of the teachers' experience of the BTN.

The third question addresses the psycho-motor aspects of the experience of the teachers participating in the BTN.

- What is the significance of email as a communication medium for the BTN?

Email is the primary means of communication in the information society and is central to the experience of the member teachers of the BTN. Email is also recognised by the South African Education Department as the most common use of ICT at schools that are connected to the Internet. Email is worth examining as the medium for facilitating participation and reification⁴, two vital aspects of a CoP, that lead to the negotiation of meaning or learning through reflective practice.

The research questions clarify the focus of this study as a description of the phenomenon of a distributed CoP of biology teachers employed at IEB secondary schools in South Africa. The affective, cognitive and psycho-motor aspects of the distributed CoP are examined with the aim of improving the practice of the BTN and informing the discourse on distributed CoPs by examining a South African example that uses a manually moderated email list.

1.5 Research methodology

A qualitative case study approach was selected as the methodology is seen to “portray, analyse and interpret the uniqueness of real individuals and situations through accessible accounts”. In order to collect the “accessible accounts” data was gathered from two sources: a focus group interview and an analysis of the email traffic of the BTN from 2004 to 2006.

The focus group interview was recorded using a DVD recorder. An open-ended questioning technique was used based on reflective listening techniques. The interview was then transcribed and manually coded. Email traffic was analysed using a spreadsheet as an organising tool to facilitate memoing and coding.

⁴ Participation, reification and negotiation of meaning are key terms used by Wenger to describe a CoP. They are expanded upon in the Literature Review.

The data from these two sources was 'sieved' through three instruments derived from the literature. The first instrument of analysis was a table of 21 structuring characteristics of a distributed CoP. The second instrument was a checklist of 14 indicators of a functioning CoP and the third a taxonomy that classified emails according to a seven level set of descriptors that measured the cognitive level of reflective practice.

The data was analysed against a backdrop of Grounded Theory and interpreted using the concept of CoPs as a theoretical framework.

1.6 Delimitations

The case study methodology is qualitative by design and every effort was made to ensure the validity of the data and analysis. Researcher bias cannot be completely discounted as the researcher acted in the role of participant observer. The role of participant observer raises the risk of bias but can yield deep insights .

1.7 Overview of chapters

The following Table summarises the content of each chapter.

Table 1: Chapter Summary

Chapter	Title	Summary
1	Introduction	The chapter provides the background and reasons for choosing the topic as well as summarises the data sources, methodology and data analysis.
2	Literature review	The literature review places CoPs in the domain of knowledge management and discusses the theoretical framework of a CoP. Distributed CoPs are discussed with special reference to teacher professional development and distributed CoPs in South Africa.
3	Research methodology	The case study methodology is discussed as well as the methods used to gather and analyse the data. Validity issues are addressed with a focus on Grounded Theory.
4	Findings	The data analysis was completed using three different instruments and yielded evidence to address the research questions. A comprehensive picture of the BTN was constructed and the affective, cognitive and psycho-motor domains are discussed.
5	Conclusion, reflections and recommendations	The analysis of the data is discussed in the context of the critical research question and three specific questions. A set of CoP implementation guidelines was developed from the description of the phenomenon the BTN.

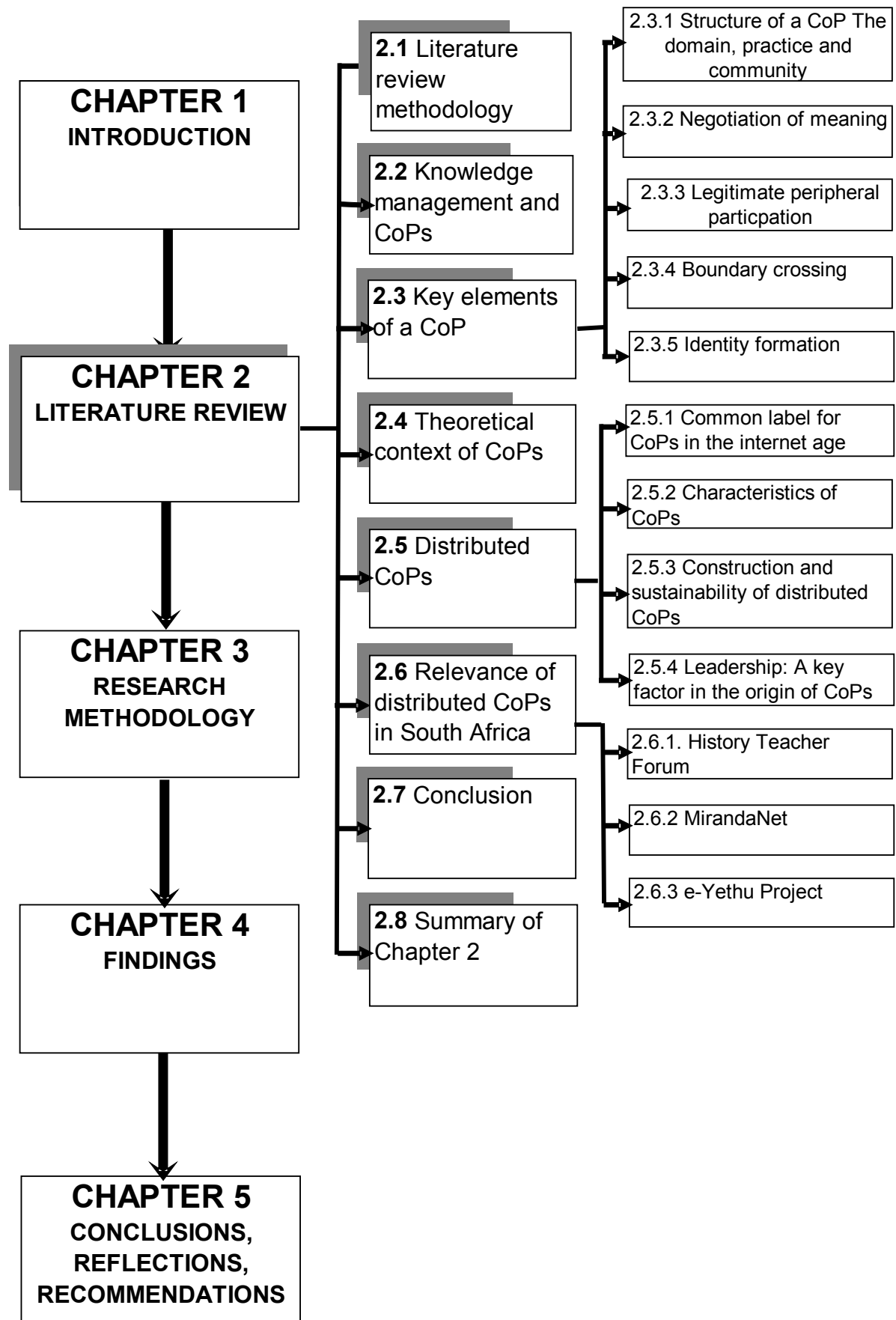
1.8 Conclusion

The BTN is an object of research because it provides a unique example of a distributed CoP of secondary school Biology teachers in South Africa. A case study approach and the associated methods of a focus group interview and the analysis of emails provide rigorous techniques for data gathering. The concept of a CoP provides a useful perspective and suggests tools for a coherent analysis of the phenomenon. The interpretation of the results is underpinned by Grounded Theory.

1.9 Chapter 1 Summary

This chapter provided a rationale, background, delimitations and research questions for the study. It also gave an overview of the methodology and the theme for each chapter.

Chapter 2 is a review of the literature starting with Knowledge Management (KM) and focusing on CoPs and distributed CoPs.



Chapter 2 Literature Review

The aim of this study is to describe the phenomenon of the BTN by looking at the cognitive, affective and psycho-motor domains with respect to CoPs. The specific research questions guided the literature review in order to construct a knowledge base of the theory, practice and research of CoPs.

This chapter describes the methodology of the literature review and then reviews the concept of CoPs from a variety of angles including Knowledge Management (KM), CoPs in general, distributed CoPs and the relevance of CoPs in South African education and teacher professional development.

2.1 Literature review methodology

In order to identify the relevant literature I started using the ERIC database. I used the phrases “Internet Mediated Communities of Practice”, “Virtual Communities of Practice” and “Communities of Practice”. I felt it was important to locate this research in a South African context and I searched for articles using the term “Community of Practice” and “South Africa”. ERIC is a repository for articles of an educational nature and yielded a small number of articles compared to the number retrieved using Google Scholar. I focused on articles discussing CoPs and specifically distributed CoPs with an emphasis on education. Once I had collected several articles in electronic form I copied and pasted the references into a spreadsheet and sorted the data according to author names. Through this process I identified key authors and searched using their names in the author field of Google Scholar. This method yielded several more articles of relevance and led to the sourcing of books related to the research questions.

In order to develop a framework for the research methodology I searched for articles on “Grounded Theory” which yielded useful summaries and discussions. Two useful books provided the guidance on the methods supporting a case study approach .

Another more serendipitous method was to web surf using an open source software package called Stumbleupon.com. Stumbleupon.com currently has over one million members worldwide who have rated websites that they feel are worthwhile. Using Stumbleupon.com I found websites and a thesis, published under the Creative Commons licensure, related to CoPs and distributed CoPs.

I did not include papers on the popular phenomena of online communities, nor did I include articles that described CoPs and distributed CoPs as learning tools for the classroom. The focus of the BTN is a distributed CoP made up of teachers and the topics in this section, while related, are beyond the scope of this study.

2.2 Knowledge management and CoPs

Knowledge Management (KM) is the starting point for the literature review as CoPs are part of a broader theoretical and practice based landscape, not an isolated construct.

CoPs are considered to be one of the components of successful KM. The need to codify knowledge spawned the KM movement. This has led to debate about what knowledge is and how it can be distinguished from information or data. Wilson argues that knowledge is “what I know” and information is “what I am able to convey about what I know”. This dichotomy appears in many forms in the debate, and knowledge is divided into the tacit and explicit or hard and soft . Hard knowledge is that which can be articulated and soft knowledge cannot .

The differentiation between hard and soft knowledge is relevant as CoPs are seen as a possible way to manage soft knowledge. This differentiation led to an important debate regarding the whole purpose and direction of KM. Wilson (2002) predicts the demise of the KM as it is not managing knowledge but information. Hildreth and Kimble (2002) agree that KM is in the business of Information Resource Management (IRM) and is focused on managing structured knowledge. However, Hildreth and Kimble view all knowledge as a duality of hard (explicit) and soft (tacit) knowledge which is in a dynamic balance. Wilson counters that soft knowledge cannot be managed and is elusive, but Hildreth and Kimble suggest that if a less representational and more constructivist view is taken, then so-called soft knowledge

can be managed through the implementation of CoPs. This is because CoPs are “in the best position to codify knowledge, because they can combine its tacit and explicit aspects” .

CoPs are considered, along with knowledge repositories, expertise directories, peer assistance, and best practice replication, as the tools necessary for effective KM .

Knowledge is considered to be living by Wenger and CoPs are able to steward knowledge as the practitioners (community members) create and share the knowledge pertinent to their particular focus. The practitioners know what they know through the social forum of a CoP .

KM is a necessary component of any organisation that deals with knowledge, and schools and teachers are no exception . By implication a CoP is part of the education landscape and is an appropriate theoretical framework against which to evaluate the Biology Teachers’ Network.

2.3 Key elements of a CoP

There are several definitions of CoPs in the literature. A definition that links CoPs to KM is: “Communities of practice are social structures that focus on knowledge and explicitly enable the management of knowledge to be placed in the hands of the practitioners” . To illustrate the range of definitions, this next definition highlights the organic nature of CoP: “Communities of practice are the informal networks of collaboration that naturally grow and coalesce within organizations” . The informal and loose nature of a CoP is partially contradicted by a definition that stresses close social and historic bonds between the members: “Communities of practice are characterized by tight knit groups of people who know each other well. They have been working together for sometime, and are bound together by their shared practice and identity” .

There is a divergent range of definitions because, according to Johnson , most literature quotes Wenger when defining a CoP and his definition of a CoP is broad. Wenger states that “Communities of practice are an integral part of our daily lives. They are so informal and so pervasive they rarely come into explicit focus, but for the same reasons they are quite familiar” .

To bring the concept of CoPs into focus several key elements are clarified, primarily by the works of Wenger, but no less importantly by other authors. These key concepts will be covered here as they provide a language for the phenomenon of a CoP. They are:

- Domain
- Practice
- Community
- Negotiation of Meaning
- Legitimate Peripheral Participation
- Boundary Crossing
- Identity Formation

There are several other elements that underpin the theory of CoP, but these seven inform the aspects of the discourse relevant to this discussion.

2.3.1 Structure of a CoP: the domain, practice and community

A CoP is made up of a Domain, a Practice and a Community. The Domain is the focus, the Practice is the shared repertoire of resources and the Community consists of the members who interact . These simplified and filtered definitions are a wisp of the detail constructed by Wenger in his seminal work 'Communities of Practice, Learning Meaning and Identity' . For example, the concept of a Practice is broken down into several components, viz: practice as meaning, community, learning, boundary, locality and then knowing in practice. Examining the concept of practice as meaning reveals a complex interplay between the concepts of “negotiation of meaning” and the duality of participation and reification .

Fortunately the literature has several articles that elucidate the concepts and in a later work, 'Cultivating Communities of Practice' by Wenger et al. , a more direct and pragmatic approach is followed. Here a Domain is identified as the element that “creates common ground and sense of common identity / affirming its purpose and value to members and other stakeholders”, the Practice is “a set of frameworks, ideas, tools information styles, language, stories and documents that the community members share”, and a Community is that which “creates the social fabric of learning / interactions and relationships built on mutual respect and trust” .

The Domain, Practice and Community are the primary structures of a CoP but the negotiation of meaning is a central process that cements the structure of the CoP.

2.3.2 Negotiation of meaning

The negotiation of meaning is a process of emergent learning through the personal interactions in a CoP. Two processes feed the negotiation of meaning. The first is the process of participation which is the interactions between the members of the community. The second is the process of reification which is the implicit being made explicit. An example of reification is the development of a curriculum or the simple act of writing an email. These two processes are a duality and work together simultaneously. Through this social process a form of learning takes place that would not happen in isolation.

A consequence of negotiation of meaning is the process of legitimate peripheral participation.

2.3.3 Legitimate peripheral participation

Legitimate peripheral participation is the gradual introduction of a novice in a CoP into the mainstream of the CoP through a process of participation rather than a process of reification of a curriculum . Legitimate peripheral participation is a key concept as it explains why it is reasonable for a significant proportion of the members of a CoP to hover on the margins. It also explains the difference between non-participation and marginality which will be scrutinised later in the context of distributed CoPs.

2.3.4 Boundary crossing

The boundary of a CoP (including distributed CoPs) is created through the process of reification and participation and is defined by a discontinuity. In other words, the CoP develops its own mix of characteristics (domain, practice and community) resulting in a unique identity that sets it apart from other CoPs.

There are two connector processes which remove the possibility of total isolation of a CoP. The first process consists of boundary objects or artefacts, e.g. letters, manuals, emails, databases that simultaneously help define the CoP and make connections with other CoPs through mutual use and interaction. The second is a more human element called brokering. Brokers are members of the community that are able to make participative connections that enable new possibilities for meaning and therefore learning .

Boundary crossing ensures that CoPs and distributed CoPs do not exist in isolation and undergo the dynamic interactions that ensure sustainability.

2.3.5 Identity formation

Wenger emphasises identity formation as it clarifies the apparent dichotomy between the individual and the community. The process of negotiation of meaning, fed by the events of participation and reification, results in the life experiences of the members of a CoP becoming an identity.

Hung and Nichani (2002) focus on identity formation to distinguish between quasi-online/distributed CoPs and genuine distributed CoPs. The difference between the two boils down to identity formation as their argument is that many distributed CoPs are no more than a loose group of people sharing information. The process of identity formation cannot take place under this condition and hence the particular social network in question cannot be considered to be a true distributed CoP.

The concept of a CoP was introduced from the perspective of KM and while there are several aspects to the theory of CoPs, seven were highlighted. The Domain, Practice and Community provide enough information for the structural context of a CoP. Negotiation of meaning and legitimate peripheral participation highlight the main processes involved in a CoP and the concept of boundary crossing links CoPs to other CoPs and the outside world. Identity formation removes the apparent dichotomy between CoPs and individualism and focuses on a deeper level i.e. human consciousness . This leads to the next focus of the literature review, the theoretical context of CoPs.

2.4 Theoretical context of CoPs

Wenger describes a complex set of interacting axes in order to locate the Social Learning Theory that underpins CoP. The essence is that people learn from each other when they interact with one another. This fact is supported by the theory of Social Constructivism espoused by Vygotsky .

CoPs are placed in the arena of Social Learning Theory and Wenger locates the theory of CoPs in a level midway between a specific interaction (such as an isolated conversation) and an overarching continuity (such as an entire corporation or even a nation) .

In his 1998 book “Communities of Practice” Wenger hints that the scope of engagement for CoPs, while dependent on specific places and times, could possibly be expanded due to the innovations in technology. He warns that these technological developments are “not simply straightforward expansions of our scope of engagement, rather they involve trade offs”. The result of these trade offs is that “one

kind of complexity replaces another, one kind of limitation is overcome at the cost of introducing another” .

Here Wenger is referring to the Internet and its effect on CoPs. The theory and practice of CoPs includes the notion of distributed CoPs to accommodate the profound impact of the Internet. As the BTN relies almost exclusively on the Internet the concept of distributed CoPs is examined further.

2.5 Distributed CoPs

The authors Hung and Nichani question whether a CoP can exist in an online environment . However, based on an extensive literature review on the topic, Johnson has concluded that online CoPs are viable . Hung and Nichani do not quote Johnson but Wenger et al. add to the debate by noting that CoPs in the online environment are becoming “the standard rather than the exception” and that “collocation is not a necessity” .

Hung and Nichani also question the credentials of distributed or online CoPs and state that several are quasi-online CoPs that share information but are focused on “learning about” rather than “learning to be” (Brown and Dugaid, 2000, p. 128 quoted in Hung & Nichani, 2002). Hung and Nichani suggest several criteria to distinguish a valid CoP from a quasi-CoP. In a valid CoP the members would meet face-to-face as opposed to entirely virtual encounters in a quasi-CoP. The membership is narrower than in a quasi-CoP which results in stronger “reciprocity” manifested as “direct explicit and implicit knowledge flow” .

In a recent definition of a distributed CoP, the focus is removed from the technology and returned to the heart of the matter, the community: “A community of practice is not just a web site, a database, or a collection of best practices. It is a group of people who interact, learn together, build relationships and in the process develop a sense of belonging and mutual commitment” . In order to build relationships and create the sense of belonging and mutual commitment the minimum standard in the literature is that at least the core group of an distributed CoP meet at least once a year .

A CoP can exist in a virtual environment and several labels have been suggested for the phenomenon of a CoP in the Internet age.

2.5.1 Common label for CoPs in the internet age

There are several labels for CoPs that utilise the Internet for communication, support and KM. Several authors, including Wenger, refer to CoPs that use ICT as distributed Communities of Practice . The phenomenon is defined by Stuckey as an Internet Mediated Community of Practice and a Virtual Community of Practice by the authors Dubè, Bourhis and Jacob .

As Wenger is the authority on CoPs his preference for distributed CoPs versus online or virtual is accepted and the term distributed CoP is used in this study. Wenger et al. (2002) justify the use of term, distributed CoPs, as it emphasises “the multiple dimensions of distance to bridge” . The definition is also broad enough to include all forms of ICT including phone and short message services (sms). The terms are used interchangeably in the literature, indicating that there is a shared understanding of the concept of CoPs blending with ICT. The advent of the Internet has spawned a wide range of distributed CoPs and the concept is discussed further.

2.5.2 Characteristics of CoPs

As this study focuses on distributed CoPs the following criteria, while applicable in a broad sense to all CoPs apply to this subgroup of CoPs. Distributed CoPs can be small or big and are structured to deal with their size. They can be long or short-lived, depending on how long the Domain is active. Co-located CoPs are the opposite of distributed CoPs but the key is a shared practice regardless of the form of communication.

The heterogeneous nature of CoPs has its pros and cons, as diversity can bring in different ideas or incapacitating conflict; similarly a homogenous CoP can result in stagnation. CoPs can form spontaneously or with some intervention from an institution which maps onto whether the CoP is unrecognised or recognised by that institution .

The range of distributed CoPs is further refined by Dubé et al. (2006) who identified 21 structuring characteristics of distributed CoPs. The criteria are listed in Table 2 as they provide a current and comprehensive picture of distributed CoPs and expand on the input of the previous paragraph.

Table 2: 21 structuring characteristics of a distributed CoP after Dubé, Bourhis, & Jacob

Broad Categories	Structuring Characteristics	Increasing Levels of Complexity	
Demographics	Orientation	Operational	Strategic
	Life Span	Temporary	Permanent
	Age	Old	Young
	Level of Maturity	Transformational stage	Potential stage
Organisational Context	Creation Process	Spontaneous	Institutional
	Boundary Crossing	Low	High
	Environment	Facilitating	Obstructive
	Organisational slack	High	Low
	Degree of Institutionalised Formalism	Unrecognised	Institutionalised
	Leadership	Clearly assigned	Continuously negotiated
Membership Characteristics	Size	Small	Large
	Geographic Dispersion	Low	High
	Members' Selection Process	Closed	Open
	Members' Enrolment	Voluntary	Compulsory
	Members' Prior Community Experience	Extensive	None
	Membership Stability	Stable	Fluid
	Members' ICT Literacy	High	Low
	Cultural Diversity (same profession, language, vision)	Homogeneous	Heterogeneous
	Topic's relevance to Members	High	Low
Technological Environment	Degree of reliance on ICT	Low	High
	ICT Availability	High Variety	Low Variety

It is beyond the scope of this study to expound on each of these characteristics in detail but suffice to say that this list provides a detailed benchmark for analysing distributed CoPs. Several of the characteristics will be alluded to as they are significant to this study.

The 21 structuring characteristics listed above are a checklist of criteria against which a CoP can be evaluated. However, CoPs do not exist in isolation and it will be shown that they need dynamic interactions in order to be constructed and sustained.

2.5.3 Construction and sustainability of distributed CoPs

There is no shortage of advice on how to construct and sustain distributed CoPs .

Fortunately Stuckey (2004) has produced a work that provides a distilled version of all this advice while avoiding a “one size fits all” prescription. Stuckey herself points out that the advice in the literature “runs the full gamut from fine-grained practical hints and tips to meta-issues expressed at a highly conceptual level” . An example of fine-grained advice is described by Rogers (2000), who developed three concepts from Wenger for use as a framework to evaluate a distributed CoP for e-learning. Rogers suggests “structuring activities so that each learner has the possibility to assume an active and central role. With less experienced members, the teacher may have to help them determine appropriate roles and trajectories” . Rogers not only gives an example of fine-grained advice but provides an example of the linkages between CoPs and education.

Stuckey (2004) summarises the range of advice in a matrix made up of the three columns that cover the non-linear and overlapping processes of design, implement and sustain. The vertical axis of the matrix is made up of rows that cover the areas of social ties, people, common interactions and place or area. Table 3 provides a comprehensive picture of many of the features of a distributed CoP.

Table 3: A summary of a meta-analysis of advice on how to design, implement and sustain a distributed CoP after Stuckey

	Design	Implement	<i>Sustain</i>
Common ties	<p>Situatedness</p> <p>Concentrate on communities that matter</p> <p>Define and articulate your purpose</p>	<p>Reinforce the community's focus</p> <p>Focus on value</p>	<p>Focus on topics important to the business and community members</p>
People	<p>Design for a range of roles</p> <p>Get key thought leaders involved</p> <p>Create executive awareness</p> <p>Make sure people have time and encouragement to participate</p> <p>Collect and use feedback from members</p>	<p>Find a well respected community member to coordinate the community</p> <p>Create meaningful and evolving member profiles, history and context</p> <p>Develop an active and passionate core group</p> <p>Acknowledge the voluntary nature of participation</p>	<p>Harness the power of personal connection</p> <p>Play on all motives for participation</p> <p>Build personal relationships among community members</p> <p>Don't be too strict in judging</p>
Social Interaction	<p>Develop interdependency</p> <p>Create a rhythm</p> <p>Integrate rituals of community life</p> <p>Combine familiarity with excitement</p> <p>Keep it fresh</p>	<p>Invite different levels of participation</p> <p>Create critical mass of functionality</p> <p>Provide the materials that collaboration requires</p> <p>Make it easier to contribute and access</p> <p>Rely on the fun factor</p> <p>Fit the tools to the community</p>	<p>Actively generate content</p> <p>Encourage communication</p> <p>Encourage appropriate etiquette</p> <p>Create dialogue about cutting edge issues</p>
Place or area	<p>Form communities around people, not applications</p> <p>Create forums for thinking together as well as systems for sharing information</p> <p>Design for evolution (flexible, extensible)</p>	<p>Fit the tools to the community</p> <p>Develop both public and private spaces</p> <p>Open a dialogue between inside and outside (brokering)</p>	<p>Facilitate member-run sub-groups</p>

It is not the scope of this study to elucidate each and every item of advice, but the area of leadership needs further examination in the context of Stuckey's work.

2.5.4 Leadership: A key factor in the origin of CoPs

Wenger (2004) states that the origin of a CoP can occur due to the spontaneous initiative of a passionate individual or group or it can be formally constructed through institutional planning and design. Whatever the origins the most successful CoPs are ones that are a combination of bottom-up enthusiasm from the members and top-down support from the institution.

The form of leadership referred to in Table 3 is that of a respected member of the community in the role of coordinator and ideally the involvement of thought leaders and executive support. Wenger (2001) confirms that the formation of a CoP is not guaranteed and that it depends on leadership and voluntary involvement. In a study of distributed CoP of 43 coordinators of Adult Learning Councils, the role of the moderator was deemed "absolutely critical". This is confirmed in a South African study of the potential of the Internet to provide development programmes for improving the training of teachers grappling with the reformed Curriculum 2005. Here the role of the mentor was "highly valued by the participating teachers".

Schlager and Fusco looked at the professional development of teachers and noted that the leadership of a CoP does not necessarily map onto the hierarchical structures of the organisation. The position of leadership in a CoP is not necessarily conferred by a formal process but rather through the process of negotiation. Leadership is therefore a critical element in the formation and sustenance of a distributed CoP.

Apart from the 21 structural characteristics and the criteria defined by Stuckey as necessary to construct and sustain a distributed CoP, Wenger provides a check list of 14 indicators as evidence of the formation of a CoP.

2.5.5 Check list of indicators of a CoP

Wenger lists 14 indicators that are present in a CoP and by implication a distributed CoP. The list is summarised below and it provides another tool against which a CoP can be evaluated.

A check list of fourteen indicators present in a CoP:

- Sustained mutual relationships – harmonious or conflictual
- Shared ways of engaging and doing things together
- Rapid flow of information and the propagation of innovation
- Absence of introductory preambles
- Quick set up of a problem to be discussed
- Substantial overlap in the participants' descriptions of who belongs
- Knowing what others know, what they can do and how they can contribute to an enterprise
- Mutually defining identities
- Ability to assess the appropriateness of actions and products
- Specific tools, representation and other artefacts
- Local lore, shared stories, inside jokes, knowing laughter
- Jargon and shortcuts to communication
- Certain styles recognised as displaying membership
- Shared discourse reflecting a certain perspective on the world

The checklist provides a useful tool for the analysis and evaluation of CoPs. Another dimension of evaluation of CoPs is the notion of relevance, especially in the context of teacher professional development in South Africa.

2.6 Relevance of distributed CoPs in South Africa

A study by Foulds (2005) highlights the question of the relevance of CoPs. The following review of the literature attempts to address the question of relevance of CoPs in South Africa, specifically South African education.

There is considerable research on CoPs in the business world but less focus on learning organisations such as schools . The literature search revealed four studies conducted in South Africa that focused on tertiary and secondary institution based distributed CoPs .

Carr et al (2005) focused on the development of CoPs to enhance the use of ICT and teaching at a South African tertiary institution. Due to the historical and present lack of ICT teaching at South African schools, highlighted by Howie et al (2005), tertiary education students lack the necessary ICT skills. Similarly, the teaching staff of the tertiary institutions lacked ICT skills due to historically low levels of investment in ICT at tertiary institutions. Foulds (2005) highlights the near impossibility of implementing the then Curriculum 2005 through conventional face-to-face workshops and advocates an approach that involves the use of ICT and a form of distributed CoPs. Hodgkinson-Williams & Brandt describe such a model, which includes a distributed CoP, and is elaborated on later in this section.

The litany of problems that beset South African schools are well documented, and one of the responses to this is the professional development of teachers .

Professional development is seen as critical as “teachers who engaged with the larger educational community were more likely to use constructivist and collaborative instructional strategies in their classrooms” . Haycock stressed that good teaching comes from good teachers and that professional development can play a role in promoting teaching excellence.

There are several obstacles to professional development, including reluctance by teachers to engage in discussion with their peers about their own and others work,

the difficulty of building relationships between school departments and, because classroom practice is so personal, the avoidance of reflective practice .

This reluctance to engage and reflect, results in teacher isolation, limiting professional development and teaching excellence. Several authors refer to this phenomena. For example: “The teacher’s isolation in her classroom works against reflection-in-action. She needs to communicate her private puzzles and insights and test them against the views of her peers” . Wenger confirms this obstacle: “a teacher isolated from other practitioners and immersed in classroom issues ceases to be representative of anything else and artefacts gain local meanings that do not point anywhere” (Wenger, 1998, p 115).

The use of distributed CoPs, such as EdNet@UMass, have been suggested as a means of overcoming the isolation of teachers and at the same time providing a more realistic and ongoing form of professional development . Schlager and Fusco state: “Teacher professional development is more than a series of training workshops, institutes, meetings, and in-service days. It is a process of learning how to put knowledge into practice through engagement in practice within a community of practitioners.” This notion extends to distributed CoPs as described by Gray : “Organisations and professional associations are increasingly examining the potential of online networks to enable members to share knowledge and engage in ongoing workplace learning and professional development.”

There is general agreement that distributed CoPs can provide the necessary infrastructure for informal or formal teacher professional development. This is achieved through the free exchange of resources as temporal and geographical barriers are eliminated. Newcomers are less threatened by the environment of a distributed CoP as there is a degree of anonymity.

Wenger (1998) does caution that CoPs should not be romanticised. A point expanded upon by Hung and Nichani (2002) who list the drawbacks of a distributed CoP as the loss of social nuance, low levels of trust and lack of opportunity for serendipitous exchanges due to the brief interaction times and lack of face-to-face contact.

These reservations are well founded and the following three examples of distributed CoPs, dedicated to educational professionals, highlight the above mentioned pitfalls as well as illustrate the potential success of a distributed CoP dedicated to the teaching profession.

2.6.1 History Teacher Forum

This moderated online forum in the United Kingdom has over 700 members (mainly secondary school history teachers) but only 50 participate on a regular basis. In order to prompt discussion provocative postings are posted. Considering that this group is homogenous and shares a very clear domain it should have all of the characteristics of a distributed CoP, yet it falls short especially in terms of participation.

Participation is considered to be part of the duality with reification that results in the negotiation of meaning in order for the primary function of a CoP to take place viz. learning in a social context. Non-participation can be construed as legitimate peripheral participation whereby participants “lurk” and participate passively. The natural progression of legitimate peripheral participation is that over time the member “lurker” will develop the confidence to follow an inbound trajectory towards the core group and become a more active member of the CoP. This process is limited in the History Teacher Forum as only 50 of the 700 members participated. This was

possibly due to the marginalisation of the majority of members due to the provocative actions of a minority.

The following example is a distributed CoP that has high levels of participation.

2.6.2 MirandaNet

MirandaNet began as a project with the computer company Toshiba and grew into a thriving distributed CoP made up of teachers and members from other professions. A peer review mechanism and strict entry requirements ensures a high quality of participant. Uniquely, this distributed CoP primarily uses email and a listserv to drive the interaction in addition to a website for publications .

Cuthell (2004) attributes MirandaNet's success to the use of email as a means of communication. This means that participants do not have to log into a website, they avoid passwords and rather receive information in their "inboxes". Two other reasons are related to the fact that MirandaNet organises face-to-face meetings and that the members, while primarily drawn from the United Kingdom, include international members. The face-to-face meetings allow space for the social nuances lacking in an online environment and the international component provides a dynamic environment of intellectual exchange.

Email has become the predominant means of Computer Mediated Communication (CMC) . Email is also recognised as a legitimate form of communication for distributed CoPs . Email lacks the nuances and cues present in face-to-face encounters, one of the constraints of a distributed CoP, but writing can result in clearer and well-thought-out expression, especially in an asynchronous environment .

2.6.3 e-Yethu Project

The e-Yethu project, reported on by Hodgkison-Williams and Brandt, was developed to facilitate the uptake of ICT by teachers in schools in Grahamstown, South Africa.

The theoretical framework of this project is firmly rooted in the social constructivist learning theory of Wenger and Lave. The emphasis of the project was the development of a distributed CoP.

The e-Yethu project used three strategies to sustain a distributed CoP: the maintenance of a wiki, an electronic mailing list and the “glue” of the project, face-to-face meetings every Friday. The face-to-face meetings were considered critical for the formation of a sustainable CoP successful in promoting the use of ICT .

What is particularly pertinent is that this CoP benefits several disadvantaged schools, provides a model for ICT development in South Africa and generally demonstrates the potential of distributed CoPs for teacher professional development in South Africa.

The relevance of distributed CoPs for the professional development of teachers globally and in South Africa has been established. While distributed CoPs are not to be romanticised and have significant drawbacks their impact is tangible in many spheres of human activity.

2.7 Conclusion

Knowledge management identifies knowledge as explicit and implicit. CoPs are seen as a way to manage the implicit knowledge. CoPs are defined by social learning theory and the concept was made explicit by Etienne Wenger and Jean Lave. A wide range of definitions of CoPs abound due to the broad definition that Wenger offers but essentially it is a group of people that operate as community, focus on a certain domain, through a variety of practices. CoPs have followed the technological trends and distributed CoPs use a range of Internet based resources, e.g. email, websites, file-sharing, etc. Distributed CoPs need at least one face-to-face annual meeting, where, at a minimum, the core members of the CoP meet.

CoPs interact through a process of boundary crossing facilitated by brokers and artefact movement. Learning takes place through identity formation, fed by the process of negotiation of meaning, which consists of the duality of participation and reification. Members who do not actively participate can still be on an inbound trajectory through a process of legitimate peripheral participation. Passionate leadership, membership support and institutional approval are all essential for the formation and sustainability of a CoP.

Email was highlighted as an effective means of CMC because of its ease of use. One of the most successful educationally-focused distributed CoPs, MirandaNET, uses email.

CoPs can provide the environment necessary for professional development of teachers in South Africa, despite the challenges of distance, lack of resources, etc. The e-Yethu project is a South African example of a distributed CoP that promotes professional development amongst educators.

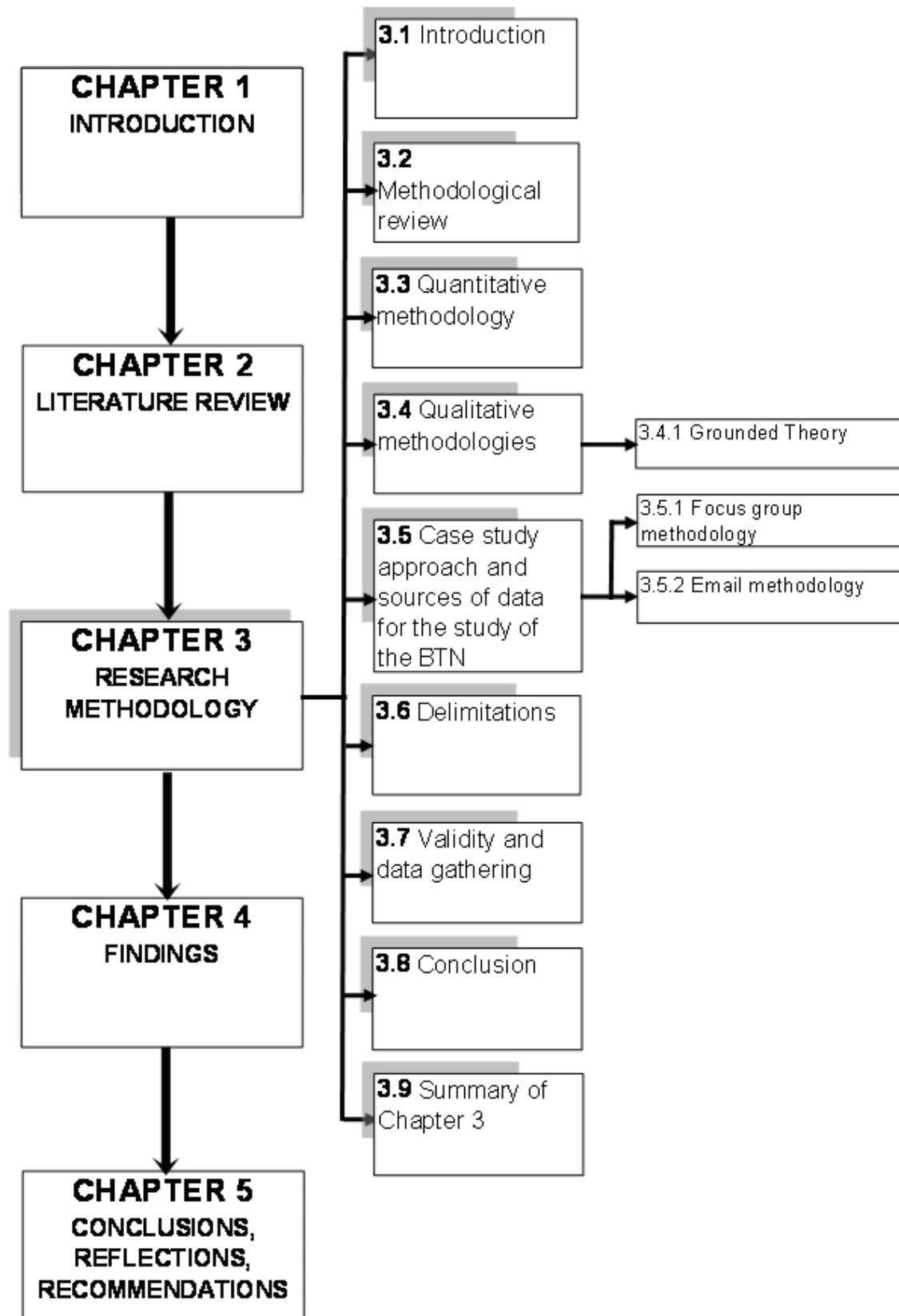
2.8 Summary of Chapter 2

The methodology of the literature review was described and Google Scholar proved to be the most useful search engine as it efficiently generated the most articles. The literature revealed a wide range of articles on the topic of CoPs, although there was less focus on secondary education, especially in the South African context.

Etienne Wenger is the undisputed subject expert and provided much of the theoretical underpinning of CoPs and with respect to distributed CoPs the debate in the literature revolved around the role and frequency of face-to-face interactions and advice on how to initiate and sustain a distributed CoP.

The relevance of distributed CoPs as a possible means of teacher professional development in South Africa was discussed. Three examples of distributed CoPs were described to provide concrete examples of the theoretical framework constructed in the chapter.

The research methodologies mentioned in Chapter 2 are elaborated upon in Chapter 3. Chapter 3 describes the methodologies, their implementation and how the data was analysed. The chapter also provides a philosophical underpinning for the research methodology and analysis.



Chapter 3 Research methodology

3.1 Introduction

Chapter 3 is a review of the literature pertaining to the research methodology used to address the research questions. The chapter also offers a description of the methods and analysis processes used to construct an accurate case study of the BTN. A quantitative approach is discussed, but the primary focus of the chapter is the qualitative approach, specifically a case study approach. Two sources of data (a focus group interview and emails) are examined as well as the three evaluative tools.

The three evaluative tools used to analyse the data are: i) 21 structural characteristics of a distributed CoP; ii) 14 indicators of a CoP; and iii) a seven level scale of descriptors to measure teacher reflective practice. A short summary of Grounded Theory is included to provide a theoretical underpinning for the research methodology.

3.2 Methodological review

Johnson's review of CoP literature reveals that the most common qualitative methodology used to study CoPs and distributed CoPs is a case study. This is because the case study design has the "flexibility and adoptability to a range of contexts, processes, people and foci" and "provides some of the most useful methods available in educational research" .

On the quantitative side there have been some recent developments in spatial analysis that can graphically illustrate the structure of distributed CoPs, especially in large organisations.

3.3 Quantitative methodology

A qualitative approach was followed and a discussion on an example of a quantitative methodology highlights why a qualitative approach was more suitable.

An efficient method of spatial analysis is described by Tyler, Wilkinson, & Humberman . The method involves a fully automated technique of identifying CoPs within an organisation using email data. Their choice of email is based on its ubiquity. They also used interviews (a qualitative methodology) to verify their data.

Spatial analysis, as a methodology, is applicable to large organisations that want to identify 'hidden' distributed CoPs over and above the formal hierarchical structure, and is not applicable to a study of a small CoP such as the BTN. A quantitative approach is not recommended by the proponents of CoPs because quantitative data is a static measure .

3.4 Qualitative methodologies

Case studies are the most prevalent form of methodology for studying distributed CoPs and several tools are used to gather and analyse the data. The theoretical framework supporting the case study methodology is drawn from the Naturalistic and participant-orientated tradition. This philosophy uses a holistic approach, drawing on a multiplicity of data from several sources. It relies on an emergent design and inductive reasoning, thereby accommodating multiple realities instead of a single reality . The design is specifically suited to researching a single phenomenon such as the BTN .

A case study is qualitative in nature and hence descriptive. The object of a case study is to metaphorically facilitate a process of crystallisation where the meaning from a saturated solution of data crystallises around a seed crystal.

The analysis of the data from a case study is often based on Grounded Theory. In order to contextualise the description of the evaluative tools a short discussion of Grounded Theory follows.

3.4.1 Grounded Theory

Two key aspects of Grounded Theory are found in the literature. The first confirms that it is possible to generate theory and achieve understanding from the qualitative data that is grounded in the lived experiences of the individuals in question. The second allows for flexibility and evolution in the process of research. These aspects provided the foundation for the research approach followed in this study.

Grounded Theory depends upon the researcher being able to think about what he or she is doing during the research process. When this iterative process of knowing-in-action is enacted consistently and reliably, the result is a data condition termed saturation. Saturation indicates a condition where no new data is found.

This process is intensely creative and human, involving meaning-making and not a passive discovery of meaning in the data. In other words “theory should not precede research but follow it”.

A criticism of Grounded Theory is that it has the potential to generate a multiplicity of interpretations which may affect the validity of the analysis of the data. Hence, the need for the rigorous implementation of case study methodology at every step.

This theoretical discussion provides the backdrop to understanding how a case study that gathers data from a focus group interview and a collection of emails can be effectively and rigorously interpreted to provide meaningful conclusions. This next section describes the methods of gathering, organisation and analysis of the data.

3.5 Case study approach and sources of data for the study of the BTN

Two sources were used to gather the data for the case study of the BTN. They are:

- i) focus group (see Addendum 1)
- ii) email data (see Addendum 2)

Each of these sources is described in the following section, with an emphasis on the issues of validity.

3.5.1 Focus group methodology

The interview process is “part of life itself, its human embeddedness is inescapable” . The choice of a focus group interview matched the intensely human nature of the BTN. There is a connection between the focus group methodology and CoPs as CoPs are also about the interactions between humans.

A focus group is also a form of convenience sampling. In this specific study the participants of the focus group are all colleagues at Western Cape Independent schools and are obliged by the IEB to meet twice a year as a cluster group. I sent out an email requesting their participation in a 20 minute focus group discussion which would be conducted after the main meeting. I received permission from the cluster leader, who was very supportive of the request. I did not, however, receive any confirmations via email from my colleagues, but on arrival at the meeting there was general agreement that if there was time they would stay behind to conduct the focus group. Inevitably the meeting ran over time but three colleagues were able to stay behind and participate.

Confidentiality was promised to the participants and it was maintained by assigning random letters to their names. There were two reasons for confidentiality. The first was an attempt to remove any barriers to voluntary participation in the focus group and the second was that even though the methodology was a case study, identity was not necessary.

The focus group met in the staff room of one of the schools. There was minimal disturbance as it was a Friday afternoon and most staff members had left the building. If anything, the situation of a staff room contributed to the high level of comfort displayed by the participants. The group appeared relaxed and humour and banter permeated the focus group discussion. The interview began at 16:33 and lasted 21 minutes. The interview was recorded using a DVD Recorder, mounted on a tripod. A test clip was recorded and the camera was repositioned to order to include the interviewer in the recording.

I began the interview by interrupting a discussion about the new grade 10 syllabus so the participants were “warmed up”. I assured them of confidentiality which was met with humour and feigned disappointment that they would not be receiving any glory. The relaxed beginning to the focus group certainly helped ease the discussion and the participants were more than willing to share their views about the BTN. They were not afraid to criticise the BTN and even made suggestions for improvements, e.g. making the subject line in the emails clearer.

I consider these observations to indicate that there was a high level of internal validity and that the participants were speaking their minds and not trying to ingratiate or please me.

The interview process and ensuring validity

I chose a non-directive interview approach as I am familiar with this method through my training as a Life Line counsellor and attendance of a workshop run by Carl Rogers⁵. The goal of training at Life Line is to ensure that the counsellor is as non-judgemental and as objective as possible, which allows the researcher to “get at the deeper attitudes and perceptions of the person being interviewed in such a way as to free them from interviewer bias” . The level of validity increases as researcher bias is reduced.

I felt entirely comfortable with the process of the interview and although I was conscious that I was taking up the valuable time of my colleagues I appreciated that they were quite willing to help out. That is why I kept the focus group to 20 minutes. I was also aware that I was not sure what I was looking for and tried and succeeded in remaining open-minded and non-judgemental. In a sense I surrendered myself to the process and let the focus group develop a life of its own. I did prepare some questions but tried to consciously let the currents of the focus group take me, rather than me trying to paddle against the stream. The end result was that I had a positive experience of the focus group and the thanks I received at the conclusion of the interview confirmed that the participants had enjoyed a positive experience.

Initial analysis

Data analysis is considered to be the most difficult and crucial aspects of qualitative research . A decision was made to manually code the transcript from the focus group (see Addendum 1) as the use of software would have required learning a new programme such as NVivo or Atlas TI. The choice of electronic or manual coding depends on funding, time, the size of the project and the expertise of the researcher. As I am unfunded, do not have the time and lack the necessary expertise the prudent route was to manually code the transcript of the focus group for analysis purposes.

I played the DVD through a computer and listened to the interview through earphones. This procedure allowed me to start, stop, play, fast forward and rewind

⁵ Carl Rogers is the originator of the concept of “Reflective Listening” as a counselling technique.

the recording from any point. A visual bar with a percentage and time reading was very useful for orientation purposes. During the act of listening I made initial field notes.

I transcribed the interview myself as the process of transcription gave me a sense of the data. The earphones helped to focus my concentration on the recording.

Final analysis

I transcribed the interview into a word processor and then analysed the data. I made field notes using the comment function of word processor so that I could link the comments with the data.

Finally, I collected all the field notes and rearranged the similar notes into clusters. Through this process I was able to extract several themes and became intimately familiar with the content of the interview.

3.5.2 Email methodology

Over 250 emails were sent and received by members of the BTN between February 2004 and 2006. The emails were sent to me and I forwarded them to the members of the BTN. All the emails were saved in a folder in my email account at Bridge House School.

A purposeful sampling procedure was followed and all the emails from February 2004 to February 2006 were selected for analysis (see Addendum 2). The 2004 emails were chosen as they are reifications of the beginnings of the BTN and the 2005/6 emails were selected as they represent a year between IEB Biology teacher conferences where the majority of the members of the BTN met face-to-face.

The sample email was opened and the header data was copied and pasted into a row in a spreadsheet. The header, sender, recipient and time-sent fell neatly into separate cells and provided a temporal view of the data.

I copied and pasted the message into a comment box so that when I placed the cursor in the next cell in the row the message would appear. The final step was to open any attachments, save them in central folder and create a hyperlink to that

attachment in the next cell in the row. At the end of this process each row in the spreadsheet contained cells under relevant column headings that graphically displayed the information of the emails.

Initial analysis of email data

Email is the primary form of communication for the BTN. In order to establish the quality of the email traffic as it pertains to a distributed CoP, a classification system based on reflective practice was adapted from Hough, Smithey and Everston . These researchers were interested in the reflective practice of intern teachers and analysed the online postings of the intern teachers according a seven level scale of descriptors.

The levels ranged from level one, where the posting was unrelated to the teaching practice through to level seven, where the posting contained reflections that used correct pedagogical terminology and included references to a theoretical framework, e.g. Constructivism. The level seven reflection was also relevant to the contextual considerations of the discussion, including ethical, moral or political issues. Once the postings were classified they were analysed using the statistical package SPSS.

The level descriptors are reproduced here but without the examples provided by Hough, Smithey and Everston (2004).

Table 4: Level descriptors of reflection for classifying online postings of teacher reflective practice

Level	<i>Descriptor. Events and experiences are described:</i>
1	<ul style="list-style-type: none"> • <i>with no description of a classroom event and the message is unrelated to practice</i>
2	<ul style="list-style-type: none"> • <i>in simple, layperson terms, still generally unattached to classroom activities</i>
3	<ul style="list-style-type: none"> • <i>in appropriate pedagogical terms</i>
4	<ul style="list-style-type: none"> • <i>using appropriate pedagogical terms</i> • <i>using a rationale that relies upon traditional or personal preference</i>
5	<ul style="list-style-type: none"> • <i>using appropriate pedagogical terms</i> • <i>using a rationale that relies upon principle or theory</i>
6	<ul style="list-style-type: none"> • <i>using appropriate pedagogical terms</i> • <i>including a rationale that relies upon principle or theory</i> • <i>considering contextual factors</i>
7	<ul style="list-style-type: none"> • <i>using appropriate pedagogical terms</i> • <i>including a rationale that relies upon a principle or theory</i> • <i>considering contextual factors</i> • <i>considering contextual ethical, moral or political issues</i>

The seven level scale of descriptors was used as an analysis tool for the data collected for this study; however, no statistical tests were used to analyse the data.

Final analysis of email data

While I was busy with the process of organising the email data I made field notes in the cell adjacent to the hyperlinked attachment cell and headed the column “Initial Field Notes”. I then re-read the emails and added to the field notes and used Table 4 as a guide to classify a sample of the emails that exemplified the process of reflective practice. I did not classify all the emails according to Table 4 because the focus of the study is not to quantify the levels of reflection but to rather establish if reflective practice had taken place in the limited environment of email communication. Once this process was complete I then reread through the emails and field notes and added any further insights in the field note cells. This data was then used to synthesise the findings in Chapter 4.

3.6 Delimitations

The collected data was from two sources: email traffic and a focus group interview. The aim of the data collection was to be able to produce a detailed and focused description of the phenomenon of a distributed CoP known as the BTN. The intention was to understand the phenomenon and describe it as accurately and faithfully as possible. Due to time constraints and the limited nature of the mini-dissertation there were many aspects of the BTN that were not studied, e.g. the specific demographics of the members, their IT skills, etc., and therefore this study cannot produce an entirely comprehensive picture of the BTN.

3.7 Validity and data gathering

There are two main threats to the validity of data gathering. These are reactivity effects and the lack of standardised procedures for gathering data.

The reactivity effects were most likely in the interview, but as stated the interview process was made as natural as possible and the interviewees were comfortable with the process. The use of a spreadsheet to organise the data from the emails and the use of the comment function in a word processor to record the initial field notes minimised the threat to validity of non-systematic data gathering.

Of further concern was the role of myself as a participant observer. The concern was that my presence as the moderator of the BTN would alter the behaviour of the members when I started the research. This effect was not evident in the interview process, and as stated earlier, the interviewees even criticised the content of the subject lines of the emails. I took this readiness to criticise as a sign that their honesty was not compromised.

3.8 Conclusion

A case study approach, based on the Naturalistic tradition of qualitative research, was identified as the most suitable methodology for researching a phenomenon such as the BTN. A sample of emails and a focus group interview were identified as appropriate sources of data for the case study methodology. The validity of the data

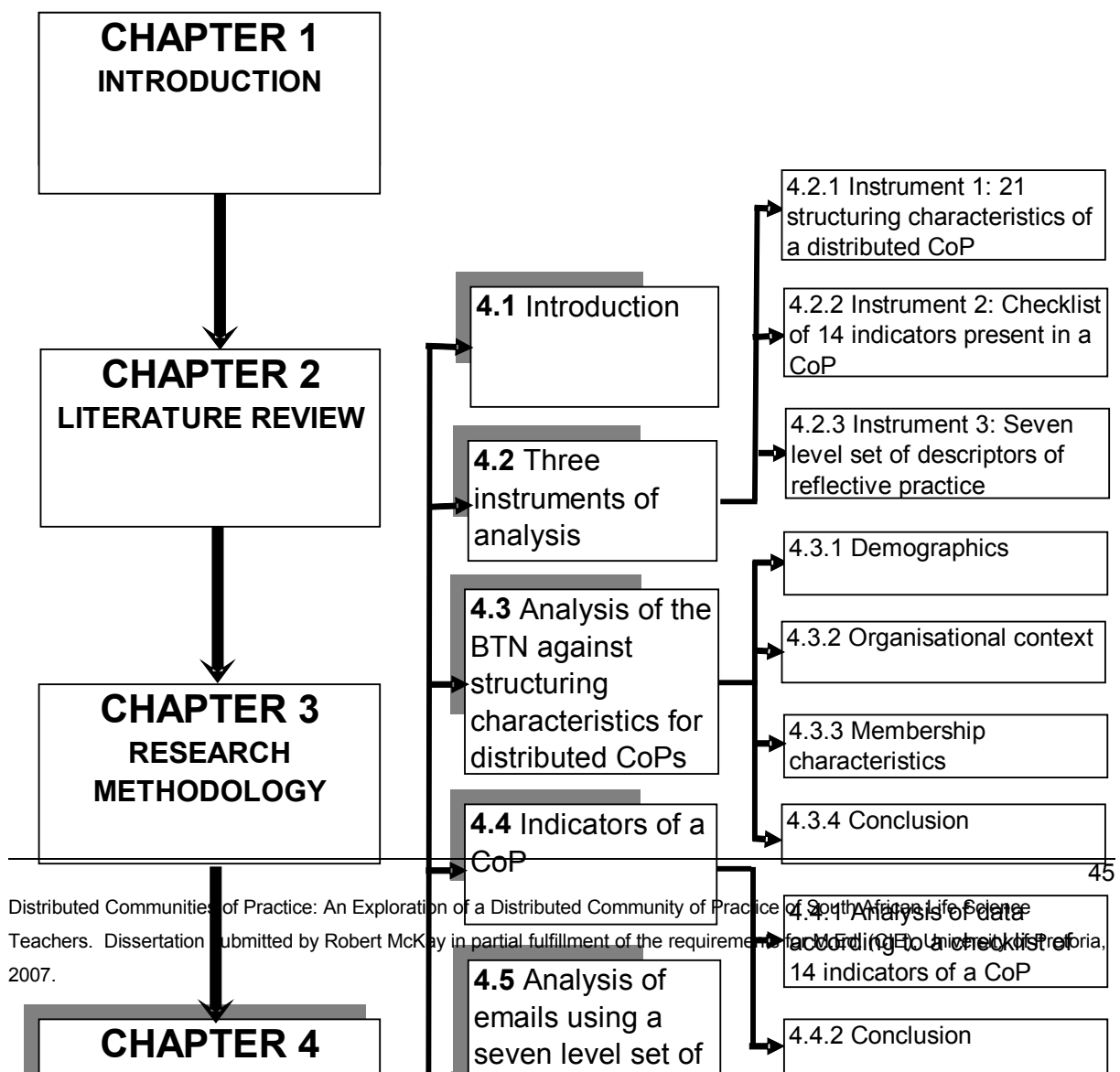
gathering process was achieved through rigorous attention to the methodology as suggested by the proponents of Grounded Theory.

Validity issues were also addressed during the initial analysis of the data from each of the sources. The data gathered for the study was trustworthy and a high level of integrity was applied.

3.9 Summary of Chapter 3

Chapter 3 began with a review of the literature pertaining to the methodologies used to research CoPs and distributed CoPs. The case study methodology emerged as the best option. The second part of the chapter was devoted to describing the data gathering and analysis processes with reference to ensuring the validity, trustworthiness and integrity of these processes.

The data gathering and analysis processes yielded a focused description of the phenomenon and the findings that are discussed in Chapter 4. Chapter 4 details the three instruments that were used to analyse the data (email analysis has already been discussed). The findings from the process of analysis using the three instruments are discussed in Chapter 4.



Chapter 4 Findings

4.1 Introduction

The aim of this chapter is to offer a rich description and further analysis of the BTN in order to answer the critical research question: What perceived events are observable in the phenomenon known as the Biology Teachers Network?

Wenger cautions against the development of a “simple metric that would yield a clear cut answer for each of the social configurations ... by specifying exact ranges of size, duration, proximity, amount of interaction or types of activities”. The social configurations he is referring to are the variants of CoPs. In order to avoid this hazard of measuring the trees without seeing the forest, so to speak, three separate instruments are used to sift through the data. The use of these three instruments enables the researcher to view the data from a variety of perspectives. Each perspective adds a different aspect to the overall description of the BTN.

The data sets are the emails exchanged between the members of the BTN from early 2004 to February 2006 and a focus group interview with three members of the BTN. The three instruments used to analyse the data are a set of 21 structuring characteristics of a distributed CoP, a check list of 14 indicators and a set of level descriptors for evaluating reflective practice from online postings (as discussed in Chapter 3). The three instruments are revisited in the next section.

4.2 Three instruments of analysis

4.2.1 Instrument 1: 21 structuring characteristics of a distributed CoP

Dubé, Bourhis, & Jacob developed a list of 21 structuring characteristics of a distributed CoP. The characteristics are summarised in Table 2 and the data was analysed using this matrix.

4.2.2 Instrument 2: Checklist of 14 indicators present in a CoP

The second instrument is a check list of criteria, suggested by Wenger, as indicators of a CoP. The list is summarised in this chapter and the data was analysed using the check list of indicators.

4.2.3 Instrument 3: Seven level set of descriptors of reflective practice

The third instrument is a classification scheme for online discussion that provides a measure of reflective practice. A selected set of emails was analysed using this classification scheme after Hough, Smithey and Everston (2004). The scheme is summarised in Table 4 in Chapter 3.

4.3 Analysis of the BTN against structuring characteristics of distributed CoPs

Each of the 21 structuring characteristics will be dealt with separately with supportive evidence from the email data, the focus group or the story.

4.3.1 Demographics

The data for the demographics for the BTN are drawn mainly from my own observations and supportive data from the emails. The spontaneous origin of the BTN makes its orientation operational. The BTN has been in existence for three years and its membership has grown from the five founder members to the 104 to date. The first attempts at forming the BTN were through Yahoo but only four teachers were successful in registering and becoming part of the Yahoo group. Considering the growth of the BTN, its life span could be considered to be more permanent than temporary, but its age is still young.

4.3.2 Organisational context

The Organisational context is broken down into five sub-categories and each will be dealt with individually.

Boundary crossing

CoPs do not exist in isolation and make contact with other CoPs. Evidence of boundary crossing is in the emails, sent and received, by teachers from non-IEB schools who provide a Government perspective on issues. The following email quote from a non-IEB teacher highlights the contribution a non-IEB teacher can make to the debate surrounding the implementation of the Further Education and Training (FET) phase.

“Do you have copies of the doc handed out by the dept at the training session in June (I have a copy of a copy of a copy so looking fairly faint by now) of a booklet called Life Sciences Resources for educators; subject orientation 2005 where they give exemplars of work schedules for each grade which include how long to spend on each section in each grade?” email sent: 2005/09/08 09:58

Boundary crossing is an indication of the vitality of the BTN and is critical for the sustainability of the BTN. The phenomenon of boundary crossing promotes the integration of new ideas and concepts into the BTN.

Environment, organisational slack and degree of Institutionalised formalism

As stated earlier, the BTN was formed from the bottom up on the initiative of a practitioner (in this case myself). The only permission sought was from the members themselves, and this occurred at the annual 2003 IEB Biology teachers' conference. As a result, in 2007 the organisational slack is high and while the BTN is not unrecognised it is certainly not institutionalised. The only formal organisation that could have any role in overseeing the BTN is the IEB and there has only been support for the BTN. The IEB representative for Biology is on the mailing list and is party to any emails that deal with the IEB. There is no evidence that this has restricted the BTN in any way and the following quote illustrates that the members are quite willing to speak their mind even if it involves a product from the IEB. In this case the discussion surrounds a final exam which was set by examiners appointed by the IEB.

“We are having a small freak about the exam. In particular what is Barfoed's? Is it Fehlings? Why is there such a large practical component examined? Since when is stomatal opening and closing in the exam? Dichotomous keys haven't been required forever? Nothing on the ear? No pop dynamics in section B and an exact replica of a recent previous exam essay”. Email sent: 2005/10/31 13:00

While the IEB representative did not reply to the email (there is formal examiners' report- back at the conference) the author of the email could take solace in the fact that their concerns were shared with others on the network.

Leadership

Leadership is considered to be critical for the initiation and sustainability of a distributed CoP. Passionate leadership is at the core of the BTN and a small group of committed core members has developed. Of the emails sent in 2004 and 2005, 22 members sent more than one email, and of those, 10 sent more than five emails. As a participant observer, it is difficult to comment on one's own leadership of the BTN but several emails of thanks are testament to the effectiveness of the leadership.

My passion is evident in an early email:

“I will check it out and see what the problem is ... teething problems ... please stick with this because it does work ... trust me” Email sent on: 2004/06/06 14:53

I further explain my motivations in an email that reveals my less altruistic motivations.

“Not a schlep at all. My aim is to increase collaboration via the Internet as it is such an amazing tool for us teachers. I benefit as well as I expand my resources and I am also a "single department" teacher so it keeps me in the loop of things ... so like most things in life it looks altruistic but it has fair dose of self interest ...” Email sent on: 2005/05/09 09:39

However, I seem to have the personality of a maven,⁶ and I am baffled that anyone would not want to share information. It does not enter my realm of thought. This email sent in May 2005 epitomises my thinking.

⁶ A maven is a personality type that is happy to share knowledge with anyone .

I think there is a mindset about sharing and as you say people don't think that their work is worth sharing ... I am not even going to contemplate that there are selfish people out there who won't share. I still get requests for the CD of work, so clearly people are into the taking side of sharing. But it will grow ... in time.

There are incredible things that can be done with technology that can enhance our teaching and make it more fun for us and the kids... Email sent on: 2005/05/03 13:06

The leadership of the BTN is appreciated by the members and is supported by a core group of participants.

4.3.3 Membership characteristics

There are several sub-categories of membership characteristics. There was no formal survey of the members' characteristics for this study but many of the attributes are evident in the data.

4.3.3.1 Size and geographic distribution

As mentioned earlier, the current size of the BTN is 104 members. The members are primarily Biology teachers in schools all over South Africa with Namibians providing an international component. The dispersion is such that the only time the teachers have formal face-to-face contact is at the annual Biology Teachers' Conference (generally reserved for the Heads of Department) and at regional cluster meetings that have to occur at least twice a year. Any other contact is dependant on geographic proximity.

4.3.3.2 Member selection, stability, enrolment and cultural diversity

The BTN is open to anyone who wishes to join voluntarily. The membership has increased steadily and the IEB conference provides ample opportunity for recruitment. In order to join, all a potential member does is send an email to the moderator who adds them to an address book. Generally a welcome email goes out after the person's name has been entered. An example is cited below:

"Dear Rob

Would you please be so kind as to put my name on your mailing list for Biology teachers? If there are any costs involved, please let me know and I will pay you during marking.

Take care and thank you.” Email sent: 2005/11/26 01:03

This email also highlights the informal and friendly nature of the BTN and the willingness to contribute to any costs (which apart from an annual CD-ROM are non-existent). It shows that the members are willing to make a sacrifice to be part of the network.

The term cultural diversity does not refer to race but rather to a shared language, profession and vision. While there are no emails in another language there are members who are teachers in Afrikaans medium schools. In terms of profession and vision, the members of the BTN are broadly aligned and subscribe to a philosophy of Independent Education. This has become an issue in recent years as government oversight, has increased as illustrated in the following email:

“As far as I understand it, the IEB is bound (by UMALUSI)⁷ to follow the state and will not enjoy very much autonomy.” Email sent on: 2005/09/13 11:52

The BTN is an open and welcoming network. The regular sending and receiving of emails indicates a reasonable level of stability, and the participation of teachers from diverse backgrounds indicates an acceptable level of cultural diversity.

4.3.3.3 Members’ prior experience

While there is no direct evidence in the emails of whether the membership had any prior experience of an electronic mailing list, there was a definite bafflement when I initially suggested the formation of such a list. The limited response to the Yahoo sign up was an indication that most IEB Biology teachers had limited experience of electronic mailing lists. The members of the focus group were asked if they had had any prior experience and the answer was a unanimous “no”.

⁷ UMALUSI (the Shepard) is the accreditation body that monitors all national education institutions, including Independent Schools who subscribe to the IEB.

4.3.3.4 Members' ICT literacy, reliance on ICT and ICT availability.

No formal survey or skills inventory was undertaken, but again the inability to sign onto Yahoo and register, the low initial sign up rate and the subsequent relative success of a manually operated email list indicates that even though the original members of the BTN come from well-resourced schools the ICT skills were lacking at the inception of the BTN.

The following email illustrates the point.

“Hi Rob, the concern is the getting into being allowed to be part of it from the beginning - the process. I emailed you, as we were told at conference. You responded and then theoretically I could be part of the group. But when I go to the side it asks me user name and password. I type in my email address, and then try and give it a password to start with, but it says the password is invalid. Is there a set password for all of us? This is the step where all of us are getting bogged down. It has the facility to ask questions, but the answers don't apply.” Email sent 04/06/2004 13:51:37

The focus group also revealed a distinct dislike for websites as an administrative tool because of the time it takes to log on and the use of a password and user name.

P: and I don't want to, I mean fundamentally I don't want to, I don't want to run around after someone else's website, where I've got to check and then I've got to enter a password, and then I don't know the password ...

J: and it's always WZT4 (laughter)

The excerpt from the interview also revealed that teachers often receive several emails in a day and that even if they are employed at a well-resourced school the network is still slow as there are so many users. The time to check a website, in case there is something of interest, is not available and the email system was considered to be a more efficient means of communication.

The BTN has fostered an increase in the level of the ICT skills of the members through the problem solving that has taken place. A subsequent email from a member celebrates the newly acquired skill of zipping a file in order to compress it.

This is one of the benefits of the BTN, i.e. the general increase in basic ICT skills membership.

“Rob I was just reading your email explaining how to zip and email a document and decided to try it on the photosynthesis worksheet I had just completed and it went from a 3,564 KB document to something like 305 KB and it was also really easy. Won't one of you let me know if you can open this and if its layout is okay? This is definitely the way to go - it is so exciting as it means that I can now send a lot of my large worksheets and tests easily via email. WOW. Thanks Rob.” Email sent 2005/09/10 08:51 PM.

This email was sent on the 10th of September 2005, a full year and a half after the launch of the BTN. It was also sent by a member who is a prolific sharer and would be counted as having relatively high ICT skills within the BTN. However, the email does not just illustrate the adherence to a reified instruction. The member also engaged in a process of participation and as a result learning took place through the process of negotiation of meaning.

The process of negotiation of meaning is a central feature of CoPs and is further illustrated by the following sequence of emails. The sequence contains evidence that the member, quoted below, has a fairly sophisticated knowledge of the workings of the Internet and is familiar with the process of the file transfer protocol (FTP). However, the process was never enacted due to the lack of support from the ICT staff at the school. The first email describes the difficulties of sharing via a website called Rapidshare⁸.

“I have one problem with Rapid Share - it does not allow me to download the files because we have a proxy server. Any ideas?” Email sent 2005/08/02 12:16

As the facilitator, I had no solution to the problem and when the email went out to the BTN, no one responded. However, the member persevered and 20 days later reported that a solution was imminent.

“Sorry, our IT guy has not quite got his ducks in a row regarding the FTP

⁸ Rapidshare.com is a website that allows a user to upload and download documents free of charge. The website caches the documents for three months. The site was used as an alternative to Yahoo but was never successfully used by the members of the BTN.

University of Pretoria– McKay, R. (2007)

server - hope this week might be more possible. In the meantime, here are a couple of things I thought might be useful - two pracs, a rap and some pics - can't remember if I have sent some of them to you before. The pics open in Word - I use them as slides.

PS - Oh - the pics won't load in a folder. Need to think about this one. Will need to zip them? Sorry." Email sent 2005/08/22 11:03

Another 20 days followed and then an explanation was forthcoming which revealed a host of ICT and human problems, including the absence of IT support, illness and a server crash.

"Do you remember the problem that I was having downloading from Rapidshare because of our Proxy server and you zipped some files to send me when I let you have an FTP address? Well, here it is if you still have the files? Sorry it's so late but first our IT guy was away, then I spent a week in bed and then he was hectic because our server went down." Email sent: 2005/09/12 16:15

The fact that ICT can be fickle is well known and this interaction reveals that over a period of 40 days a teacher at a resourced school with IT support was not able to implement the relatively simple process of a FTP in order to share material over the Internet.

In another example the lack of ICT skills limited the quality of the shared work. This particular member produced electronic copies of her work but she lacked the skills to scan in pictures.

"Hi Rob, These may be of use - sorry I could not get the graph to go through, my computer skills are basic." Email sent on: 2005/07/23 19:59

The BTN is reliant on ICT as its primary means of communication is email. This is seen as way of continuing the face-to-face interaction that occurs at the annual IEB Biology Teachers' conference and the IEB mandated regional cluster meetings. A member of the focus group summarised this structural characteristic in the form of a metaphor of a castaway. In the analogy the castaway receives provisions through the medium of email and although still on an island he or she is no longer isolated.

“I think we are largely all too busy to make face to face contact with people outside of your school, I mean you guys I see four times a year, and I never phone you in between, its not to say that I wouldn't like to, I find these meetings always incredibly valuable, because you always sit down, there are certain things, you can only do face to face, they are incredibly valuable to do that, but when you can do that, you are an island essentially, and I think what you, what, what your service is offering, it makes you, it makes you an island that gets provisions, in other words you are not really like a um, watch you call it, (castaway) like a um sole survivor, you are not like a castaway anymore, which is what you could be like, and certainly people have been like, you now are like a, like a castaway but you are getting provisions in and, and its up you to obviously choose to decide what you are going to use and how you want to use it, but it is there and if you ever feeling like a castaway, you just send an email and you'll get a responses back, so I think, I think how well it works for you depends on how much you are willing to also get involved in this.”

The advantages of the BTN as a way of supporting the work at the annual conference and cluster groups is evident in the following extract from the interview.

J: We only see each other 3 times a year and also

Myself: You have colleagues who support you at school and that kind of thing?

J: No but it's not the same, because you've got one or two colleagues but you...

P: If you are lucky.

J: If you're lucky, sometimes you don't, but also you don't necessarily have experts or you can have contact with other experts, I consider M an expert, so having contact with her provides me with extra stuff that I wouldn't necessarily get here, and hopefully from like also some other people, who also glean things from me, so you meet up with people who can support you sometimes with more than what you got.

There is a high degree of reliance on ICT but it is of a low level. When the levels of ICT were extended to more unusual procedures, such as FTP, the obstacles proved to be difficult to surmount and the members resorted to attaching documents to the emails.

4.3.4 Conclusion

The BTN was analysed using the structuring characteristics of a distributed CoP listed in Table 2. There was enough evidence to form a broad picture of the BTN and secure its place as a distributed CoP that uses email as the primary means of communication.

4.4 Indicators of a CoP

Wenger suggests 14 indicators are apparent in the discourse of the members of a functioning CoP. The data was scrutinised using the 14 indicators in order to ascertain if all or only certain of the criteria were present. The 14 indicators are repeated below:

Check list of 14 indicators present in a CoP :

- Sustained mutual relationships – harmonious or conflictual
- Shared ways of engaging and doing things
- Rapid flow of information and the propagation of innovation
- Absence of introductory preambles
- Very quick set up of a problem to be discussed
- Substantial overlap in the participants' descriptions of who belongs
- Knowing what others know, what they can do and how they can contribute to an enterprise
- Mutually defining identities
- Ability to assess the appropriateness of actions and products
- Specific tools, representation and other artefacts
- Local lore, shared stories, inside jokes, knowing laughter
- Jargon and shortcuts to communication
- Certain styles recognised as displaying membership
- Shared discourse reflecting a certain perspective on the world

The data was analysed using these 14 criteria.

4.4.1 Analysis of data according to a checklist of 14 indicators of a CoP

The first criterion refers to the formation of sustained mutual relationships, whether they are harmonious or conflictual. While the members of the BTN are geographically distributed, participation in the BTN has resulted in relationships becoming stronger than they would have without the BTN. One member of the focus group summed up this development by saying:

“No, it (the BTN) certainly helped me to get to know, well I mean I’ve met JP, AP, whose names now roll off my tongue, like I know them well, I have only met them once or twice and I have seen them. I have only seen them at marking and I and I’ve seen them at conference, but from that I would never have begun to realise, just what incredible work they are doing and what incredible research they are doing.”

This quote also serves to illustrate another indicator, which describes members of a CoP “knowing what others know, what they can do and how they can contribute to an enterprise” .

The most prolific means of engaging and doing things together for the BTN is the exchange of information in the form of attachments or links to other sites. For example, one member was quite animated when sharing this resource.

“Thank you for all the info that you share with us. I found something that I just HAVE to share with you all! Please could you pass on to the others on your mailing list? It is a wonderful interactive programme on cloning. Google -clickandclone. Be patient, it takes time to load - but is worth it.” Email sent on: 2005/05/06 15:06

This example illustrates several indicators. The emails result in the rapid flow of information which then results in the propagation of innovation. The email is also an example of a form of representation. The BTN members share information using attachments which are then saved and burned onto CD-ROMs for distribution at the annual IEB Biology Teachers’ conference. This is an example of the indicator of representation of artefacts.

This rapid flow of information via email also lends itself to the setting up of problems to be discussed asynchronously and is an efficient way of gathering information as illustrated by this quote from a member of the focus group.

“If I have looked through my genetics file and I don't like the test I got and I want a new one, um the fastest way to get it is to email you and to say ... you know what's going on and that email goes out ... half an hour later I have got one from JP and I'm sorted.”

An informal form of communication (defined as the absence of introductory preamble that gives the impression that interactions are the continuation of an ongoing process) is evident in the data. The email below illustrates the perfunctory nature of the communication and also highlights another indicator: that of the use of jargon and shortcuts to communication. In this case the phrase “give exemplars of work schedules for each grade” would only be understood by the members of the BTN.

“Hi Rob

Do you have copies of the doc handed out by the dept at the training session in June (I have a copy of a copy of a copy so looking fairly faint by now) of a booklet called Life Sciences Resources for educators; subject orientation 2005 where they give exemplars of work schedules for each grade which include how long to spend on each section in each grade?

Regards C”

Email sent 08/09/2005 10:01

The following email has several indicators of a CoP including shared stories, humour and the ability to assess the appropriateness of actions and products. The email is a reflection on an IEB practical exam for the Grade 12 year.

“Well, we ran the CTA today, and in the one class the squares rose so quickly, that the kids could not time them, so we told the second class to pump the syringe to death, so they did, and then it took so long to rise that it was no good - the one kid waited 12 minutes and they didn't rise. The problem then is that there are no bubbles to observe either!!!!!!!!!! So I had to tell them to go and look at another child's beaker.”

Email sent: 2005/09/09 05:02 PM

Non-members of the BTN could not have understood that the practical exam consisted of measuring the rise rate of squares of ivy leaves that had been degassed by a syringe. They would have also not understood the term CTA used as an acronym for “Continuous Task of Assessment”. A member of the BTN is familiar with the jargon and would have found the image of a student having to “pump a syringe to death” humorous. This shared discourse is also borne out by the use of the word “child” and “kid” in place of learner or student. While the reasons for the choice of these words are beyond the scope of this study, they betray a world view that expects a mutual relationship of respect between teacher and student.

The biological concept of evolution is part of the FET syllabus, and the following email illustrates an example of communication as part of the process of developing a shared discourse and perspective on the world:

“Hi Rob

I have put together a document that some biology teachers have found helpful in clearing their thinking and understanding with a view to teaching evolution in grade 12 FET.

I worked as a molecular biologist for many years before coming into teaching; I am also an ordained minister, so I have tried to put something together drawing from my experience. It does not push one particular view but gives a background into different belief systems and how our belief systems influence the way we interpret scientific data. It also shows the changing nature of knowledge and how DNA and information technologies have increased that knowledge base.

Hope people find this useful.

Blessings SV”

Email sent: 2005/06/27 11:24 AM

This email also required members to be involved in a process of identity formation which is the last indicator to be discussed. The concept of “mutually defining identities” is critical to the formation of a CoP. The formation of shared identities provides a location for the members within a CoP and places them on a trajectory that takes a member from legitimate peripheral participation to the core of the CoP, a place where the deepest learning takes place.

As an illustration of this process one of the members of the focus group belonged to a school that was new to the IEB. He identified himself in terms of a “newby” to the IEB, which was not disputed by the focus group. Identifying himself as a “newby” confirms that identity formation is part of the processes of the BTN, and that it was not disputed points to the mutuality (shared understanding) of the formation of that identity.

Finally, humour was highlighted as important, and the most humorous comment is reserved for a certain members’ disdain for MS WORD:

“I am just not prepared to work in Word – my medical aid could not stand the strain.”

Email sent: 2005/06/14 05:48 AM

4.4.2 Conclusion

All 14 indicators are present in the data. Although some of the indicators are weakly represented in the data, e.g. stability (which could only be measured through the frequency of emails) the evidence reveals a viable and dynamic distributed CoP.

4.5 Analysis of emails using a seven level set of descriptors of teacher reflective practice.

The 250 emails sent and received by the members of the BTN is a rich source of data for the study. In order to establish the quality of the emails a selection was analysed using a seven level set of descriptors of teacher reflection. The sample of emails was drawn from a discussion on the implementation of the FET Grade 10 syllabus.

The implementation of the FET phase of the National Curriculum occurred at the beginning of 2006. A discussion arose between some members of the BTN after a question about suitable FET text books. The interchange was not typical but served as an example of the potential for the BTN to provide a forum for discussion amongst a distributed membership.

The “syllabus debate” emails provides serious anecdotal evidence of the BTN functioning as a CoP and adding value to the enterprise of teaching Biology. The exchange stretched over a period of eight days. Sixteen emails were sent by members and forwarded by myself. Twelve members participated in the exchange with three members posting at least two emails. The emails were analysed using the classification suggested by , as displayed in Table 4 on page 42 . The number of emails per level is recorded in the table below.

Table 5: Classification of email interchange according a seven level set of descriptors of reflection

Reflection Level	<i>Number of Emails</i>
Level 7:	<i>3 emails</i>
Level 6:	<i>1 email</i>
Level 5:	<i>5 emails</i>
Level 4:	<i>2 emails</i>
Level 3:	<i>4 emails</i>
Level 2:	<i>1 email</i>
<i>Level 1:</i>	<i>0 emails</i>

According to the scale of reflection the exchange of emails about the syllabus debate had a high level of functioning. The high level of discussion included at least 10% of the members and provided important information about the implementation of the Grade 10 FET syllabus.

The level 2 email sent on the 7th of September sums up the sentiment of the exchange:

University of Pretoria– McKay, R. (2007)

“I so appreciate all the emailed information that is sent to me. What a wonderful resource. I am sorry that I have not contributed more!” Email sent 7/9/2005

The exchange of emails was also able to provide a context and add to the repertoire of the BTN. It created a shared history of experience, exemplified in one of the three level seven emails that describe the issues around developing new materials and syllabus for the Grade 10 FET implementation.

“Like you, I had been waiting for the government to provide us with a syllabus. But just before the end of last term (Julyish), I received a document from Y. It was a sort of syllabus, i.e. detail added in to the FET content on pages 32-40 of the Life Science NCS⁹ booklet. She told me that it was given by the Publishers’ Association to all people writing textbooks. I emailed X to ask if this was the real thing, i.e. was it the syllabus provided by the government. He replied that it was not, that it was guidelines given out by the publishers’ assn, and that science was writing their own!!!! I discovered later that science made that decision at conference and we had been left in the dark. I was not a chipper chicken - as we have very little time and I have anecdotal evidence that when the 1996 IEB syllabus was designed that it took forever to reach consensus. So, I contacted X and asked if we should be doing our own, and he said yes. We had a meeting the following day, so I reported this back to them, and asked who wanted to work with me on designing one. Email sent 7/9/2005

⁹ National Curriculum Statement: The definitive Government Educational Policy document.

The email had all the elements of a level seven interchange as the events and experiences:

- are described using appropriate pedagogical terms, e.g. “It was a sort of syllabus, i.e. detail added in to the FET content on pages 32-40 of the Life Science NCS¹⁰ booklet”.
- include a rationale that relies upon a principle or theory, e.g. “Life Science NCS”.
- consider contextual factors e.g. “I have anecdotal evidence that when the 1996 IEB syllabus was designed that it took forever to reach consensus”.
- consider contextual ethical, moral or political issues, e.g. “I hope that people don't think that this is very high handed of me or the cluster group”.

This scrutiny of the email exchange about the Grade 10 FET implementation revealed several key aspects of a CoP and a high level of cognitive interaction.

However, the exchange was rare and the bulk of the exchanges were emails about sharing knowledge. While the participants felt that it was important to be part of the exchange on the FET syllabus, a quote from a member of the focus group illustrates that not all the email exchanges are universally embraced:

“.... I can't really be bothered, um and also the people out there panic about syllabus and are constantly exchanging emails about which syllabus is more bobaas (important), generally speaking I am binning that stuff too as well because I know for a fact what ever is bobaas (important) in 2006 will be completely different in 2008 ...”

The response of this member of the focus group illustrates a deeper issue of information overload, but another quote reveals that not all the emails are ignored and also makes a distinction between resources and procedural information:

¹⁰ The National Curriculum Statement or NCS is the National Department of Educations' policy document on the Grade 10 FET phase.

“Ja, I think there have there have been times when it has really helped and I said that to you and I have actually emailed you that response. Um, its helped me a lot with the lower grades, minor worthwhile assignments, being able to pull of a genetic test that’s twice as good as mine and use it immediately, with a printed memo, WOW, that’s a huge blessing for me, from the point of view of workload, but at the level of procedure and forms it can be murky, which one is the authoritative one?”

The classification of the emails according to a scale measuring reflective practice revealed a high level of cognitive interchange. The emails were a selected sample but indicated that the BTN has the potential to facilitate reflective practice.

4.6 Conclusion

The data from the emails and the focus group were complimented by the participant observer status of the researcher. The analysis of two sources of data reinforced the findings from each source and the intersection of the findings contributed to the level of validity and trustworthiness of the data and the subsequent interpretation.

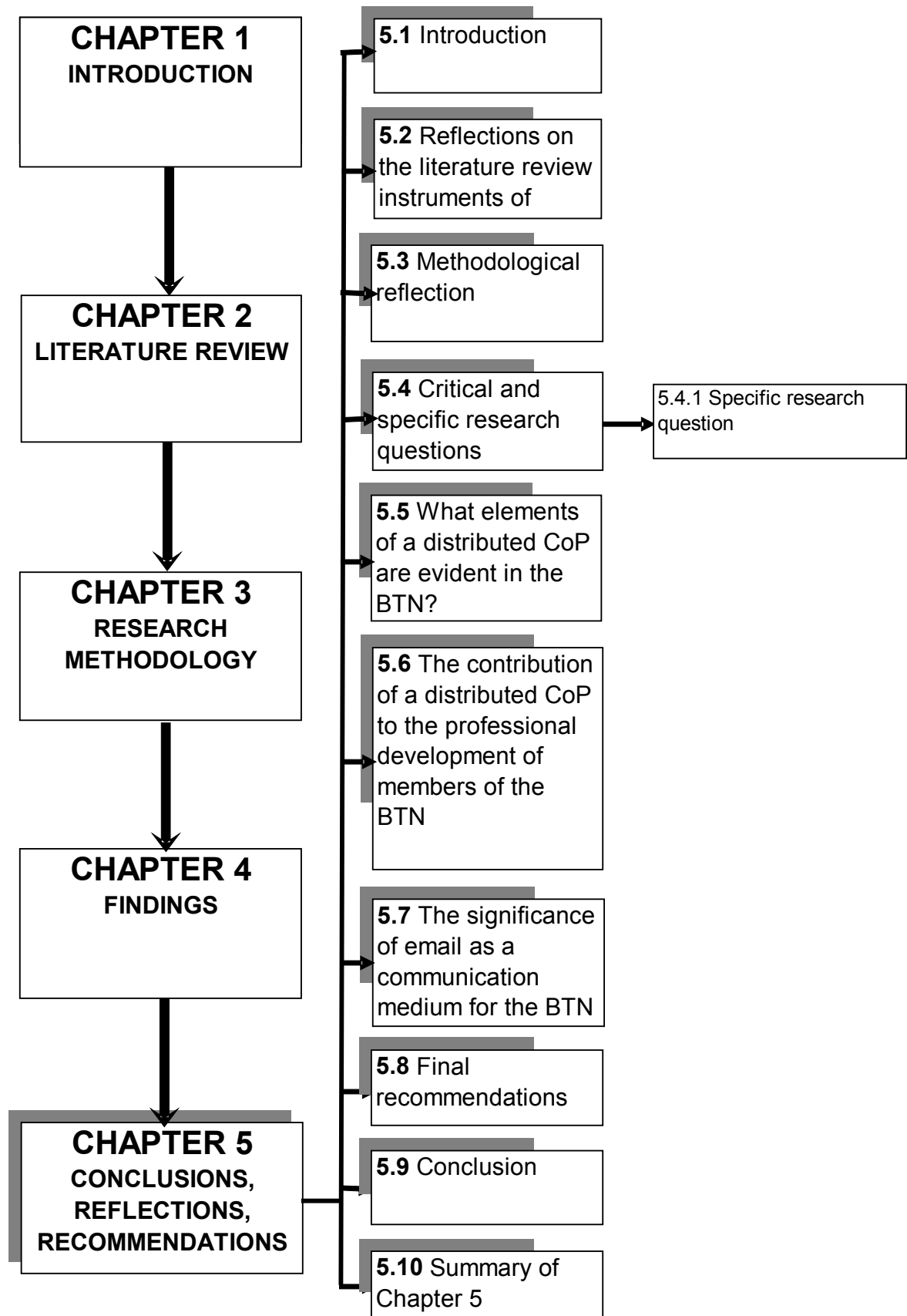
The BTN is a distributed CoP with passionate leadership and a small core of supporters. Most of the interaction is the sharing of information through the attachment of documents. Evidence from the focus group and the email analysis reveal that the process of identity formation is taking place. This occurs through the negotiation of meaning as the members share reified artefacts, e.g. worksheets, website addresses etc. and participation in the form of discussions via email and the annual face-to-face contact at the IEB Biology teachers’ conference.

There was a rich data set describing the BTN and its functions in the context of the theoretical framework of distributed CoPs.

4.7 Summary of Chapter 4

Three analytical tools were used to examine the data from the focus group interview and the email collection. The three analytical tools were a table of 21 structural characteristics of a CoP, a check list of 14 indicators of a CoP and the analysis of the email data against a seven level scale of descriptors that measured the level of reflective practice.

When the three analytical tools were applied to the data, several aspects of a distributed CoP were highlighted. The analysis also revealed deeper aspects of the functioning of a CoP, including the processes of reification and participation resulting in the negotiation of meaning, in turn leading to identity formation.



Chapter 5 Conclusions, reflections, recommendations

5.1 Introduction

In the light of the literature review and the findings, the critical and specific research questions are addressed in Chapter 5. The first section of the chapter is a reflective exercise that creates a link between the findings, literature review, methodology and the conclusions, reflections and recommendations. The second section deals directly with the critical and specific research questions and uses the responses to describe the BTN, suggest further research and provide suggestions for the establishment of educator distributed CoPs within the context of South Africa.

5.2 Reflections on the literature review

Etienne Wenger is the most quoted author with respect to the concept of CoPs . Other authors who contributed valuable thinking and information are Hung and Nichani for their questioning of the concept of an online CoP , and Johnson who pre-empted this line of questioning with a thorough review of the literature of distributed CoPs, concluding that distributed CoPs are viable. The link between KM and CoPs was made by Carroll et al. and the same authors extended the link to include education. Stuckey provided the most comprehensive advice on how to grow and sustain a distributed CoP , and Dubé et al. provided the most comprehensive structural analysis of an online or distributed CoP .

While it is not necessary to highlight all the contributions of all the authors this cluster provides the necessary framework to locate and understand CoPs in order to construct an accurate portrayal of the BTN. The abundance of the literature stands in stark contrast to the lack of published literature on the topic in the context of education in South Africa. The published examples describe the importance of CoPs as a medium for teacher development in South Africa . Their studies attested to the ICT barriers of bandwidth, lack of ICT skills and, in the case of Collie (2005), even access to a telephone. In contrast, the case study of a successful international distributed CoP of educators, MirandaNet, highlighted the role of a simple medium of communication, viz. email .

The literature review constructed a rich and varied landscape to locate the concept of CoPs and distributed CoPs.

5.3 Methodological reflection

The choice of a case study methodology was confirmed as the best format to study the phenomenon of the BTN . From the literature, three instruments were adapted to sift through the data. One instrument was specifically developed to analyse the email data , the second to analyse the BTN against the “21 structuring characteristics of distributed CoP” and the third used the “14 indicators of a CoP” . These three instruments proved more than adequate for identifying the information and evidence needed to answer the research questions.

The result was a rich and organised appraisal of the BTN as a distributed CoP. The research questions, findings, conclusions, reflections and recommendations based on this appraisal are discussed in the next section.

5.4 Critical and specific research questions

The research questions are repeated below:

5.4.1 Specific research question

What perceived events are observable in the phenomenon known as the Biology Teachers Network?

Critical research questions

- What elements of a distributed CoP are evident in the BTN?
- How does a distributed CoP contribute to the professional development of members of the BTN?
- What is the significance of email as a communication medium for the BTN?

Each specific research question will be discussed in turn in order to cover the affective, cognitive and psycho-motor aspects of the BTN.

5.5 *What elements of a distributed CoP are evident in the BTN?*

The term element refers to those basic building blocks necessary for the existence of a distributed CoP. The data provided rich examples of the elements of a distributed CoP.

Demographically, the BTN tends towards the operational and permanent, even though it is still young. The organisational context has a low degree of boundary crossing and operates in a supportive environment that experiences a high degree of organisational slack. The BTN is certainly not institutionalised nor is it unrecognised. The leadership style is one of continuous negotiation but in practice there is a single moderator who is supported by a small core group of passionate supporters. This combination of institutional slack and leadership is an ideal configuration according to Stuckey (2004). The membership is homogenous with over a hundred members representing approximately a hundred schools. The members are geographically dispersed, membership selection is open, and most significantly, voluntary. Despite the members of the BTN not having much prior experience of distributed CoPs, a significant membership developed. At inception of the BTN, the members had low levels of ICT skills but these increased over time.

In addition to these structural elements certain other key elements of the affective domain were identified as being present in the BTN. These elements are softer than those listed above and describe a distributed CoP that is vibrant and dynamic.

The BTN has the characteristics of a CoP in the “coalescing stage” . At the time of research the CoP members exhibited shared mutual relationships and ways of doing things. This resulted in the flow of information leading to problem solving through the process of negotiation of meaning and legitimate peripheral participation. The process of negotiation of meaning is exhibited in the levels of participation and the reification process of sharing artefacts e.g. worksheets. Through the email interactions a shared repertoire developed, characterised by the use of jargon, acronyms and ultimately a shared discourse that has place for a sense of humour.

From a structural and implicit point of view, all the elements necessary for a vibrant and dynamic CoP, are present in the BTN.

5.6 The contribution of a distributed CoP to the professional development of members of the BTN

The need for professional development of South African educators was established, especially in the light of research that shows that it is teachers who have the most influence on the success of a learner. Evidence from the data revealed that the members of the BTN benefited from the sharing of documents, website addresses and discussions, e.g. about textbooks and FET implementation. A knowledge repository (a CD-ROM of resources) was developed, but the distribution of the CD-ROM relied on an annual face-to-face meeting (conference) of the bulk of the members.

The BTN acted as a communication bridge between the annual IEB Biology teachers’ conferences and regional cluster meetings. It promoted collegiality through exposing members to each others’ knowledge and identified the “experts” in the distributed community. A greater culture of sharing formed, breaking down the isolation common to the teaching experience.

A significant number of the members did not contribute and to test whether the process of legitimate peripheral participation of members was on an inbound trajectory would require a longitudinal study of the BTN.

A snag was that the emails from the BTN increased the information overload experienced by teachers. This contradiction of isolation and information overload deserves further research as it could be that the information overload is a factor exacerbating isolation.

The members of the BTN benefited from the increased interaction with colleagues which lead to increased levels of professionalism. Membership of the BTN contributed to the cognitive domain of the human experience.

5.7 The significance of email as a communication medium for the BTN

Email is the primary means of communication in the BTN. It seems contradictory that in the Internet age, where the facilities for hosting websites, online discussions and even video conferencing are more readily available than ever, the BTN resorts to email and attachments.

In light of the data analysis, the choice of a manually operated email system is not a retrogressive step but, in the case of the BTN, a sensible and suitable arrangement. The advantage of email is that the information arrives in the recipient's inbox without the member having to log on to a website to see if there is new material that can be of use. The downside of the lack of a current knowledge repository is ameliorated by the reification of the shared information using the commonly understood medium of a CD-ROM.

As discussed earlier, participating in the BTN resulted in an increase in the ITC skills of the members and it is conceivable that in the near future there would be a significant core of members who would use a website as a knowledge repository in conjunction with the manually based emailing. The analysis of the data showed that most of the emails were used for information sharing. Discussions of a high cognitive level using email are possible, but interestingly the data revealed only one example.

With respect to ICT skills a contradiction emerged as the members had low ICT skills, but operated in relatively rich technological environments and relied on ICT to

complete some of the necessary tasks for their work. A significant benefit was that when members learned new ICT skills through the emails of the BTN they were able to adapt as they were not dealing with outdated ICT equipment. They had access to ICT support and there was evidence that some members drew on this resource.

Email proved to be an effective means of communication and vehicle for the informal professional development of the members of the BTN.

5.8 Final recommendations

The discussion of the data analysis revealed that the BTN is a successful distributed CoP with all the necessary elements of a CoP. It also showed that it functions as vehicle for professional development and that the medium of email is an adequate form of communication. As a result, the members of the BTN experienced a professionally supportive and stimulating, if low key, distributed CoP.

The research of the phenomenon of a distributed CoP of Biology teachers in South Africa provides for a possible strategy of implementation of CoPs that can lead to increased levels of professionalism and ICT skills amongst the participants. These recommendations are in alignment with the White Paper on e-education which makes reference to the increase in the use of email but also the limitations of using the Internet due to the “inadequate technical and pedagogical support at the local level” .

A set of guidelines for the establishment of a distributed CoP in South Africa fundamentally inform the recommendations drawn from the research in this study.

- The provision of an environment with computers that are connected to the Internet is a prerequisite for the formation of a distributed CoP. While low bandwidth can limit the purpose of the CoP it does not preclude functionality.
- The distributed CoP must be initiated and coordinated by a passionate individual who is supported by a core of passionate members. The individual must be prepared to spend a small part of the day forwarding emails from members, rewriting the subject line for clarity, promoting a culture of sharing and providing some technical support.
- Institutional endorsement and support is not necessary. If institutional support is provided it must be targeted and kept to a minimum.
- As a communication medium, email, is adequate and ideal for a membership that is relatively unsophisticated in terms of ICT skills.
- The members of the distributed CoP should be afforded the opportunity of meeting face-to-face once a year, but if that is not possible at least the core members should make physical contact.
- A knowledge repository in the form of a CD-ROM is a possible means to reify the knowledge gained from the interactions of the CoP.

5.9 Conclusion

In the affective domain, the experience of the teachers of the BTN is positive. The use of email and attaching documents has proved to be a technologically simple and appropriate method of communication. Despite the low level of ICT skills representing the psycho-motor domain, all the elements of a distributed CoP are present and the potential for growth is firmly established. The cognitive domain is well represented and the members gained professionally.

The theory of CoPs provided the theoretical framework to research, analyse and understand the phenomenon of the BTN as a distributed CoP of Biology teachers in South Africa. A list of recommendations, linked to the context of South African education, provides advice for the set up of a network similar to the BTN.

5.10 Summary of Chapter 5

The chapter summarises the findings from the data analysis and answers the critical research question by addressing each of the specific research questions. The data analysis confirms that all the elements of a distributed CoP are present, and that the BTN is a well-established distributed CoP that promotes the professional development of its membership.

The research revealed that some members of the BTN had a positive and engaging experiencing as participants of the BTN and that the simplicity of the email facilitated the functioning and sustainability of the BTN.

From the data analysis a set of recommendations are listed to provide guidance for the establishment of further networks similar to the BTN. The issue of information overload and the formal evaluation of ICT skill levels amongst teachers belonging to CoPs are suggested as areas of further research.

Chapter 6References and Addenda

6.1 *References*

6.2 Addendum 1: Transcript of Focus Group Interview

R: Thanks, thanks for doing this, basically it is for my research, on the Biology Teachers Network or BTN as I now call it so I do not have to write it out the all the time. And um, there's, there's, what I have to say beforehand that um, its um in terms of confidentiality I am not going to ever refer to you as J from R-school said this

J: So I am not going to get any fame out of this are we?

Laughter

R: No no fame, and also I have to say this as well, you are here because you want to be here, is that right (laughter).

D: you should take that gun out of

R: um as you know the history of it was that I opened my mouth at a conference the one year and decided that this was a good idea. But I just, um, ja just, just, I want honesty and contributions. This is just a kind of a, I am looking for things, no not looking for things, I am just exploring this whole idea, basically that is what my whole thesis is about, just exploring the idea of this whole thing. But it's because its internet related and I am doing a Masters in Computers and Education. OK um can you um, can you first recall when you first heard of the BioTeachers Network? When did the idea sort of first come into your frame of reference? All of you have received emails, but can kind of remember when.....?

J: I think it was my first year of being here. I taught when was it 2001, I came halfway through so beginning of 2002, was when I think it was, that's when got , we had some meetings where the idea was put out, where we started sharing, I think it was 2002.

P: In my case, when, it was at the first user group conference in 2004, where you shared that it was available.

R: The user group conference? At the Regional user group or the....

P: The big one

R: Okay, ja

J: I think it, I think it started out as lot smaller and then you began to suddenly blossom and that was obviously a bit later on.

R: Ja, D?

D: It was similar for me because we came to this meeting or a similar cluster group meeting, we were moderating and that's where you mentioned it.

R: Okay

D: Otherwise I really became aware of it at the user group conference.

J: Actually my dates are wrong as I am missing out that I went to C-school

R: Did you get emails at C-school

J: No, no what I am saying is that I went to C-school and I actually taken that out so it wasn't 2002 it must have been 2004

R: Ja, you took my job

J: What you mean, at C-school.

R: JA

J: Where you there

R: No I applied for that job you took

J: Ja, that's right

R: and I went to B-school

J: That's right

R: But I got offered it before you, of course I must have been offered it before you and on the same day I was offered the job at B-school and then I was like, because I really wanted to work with DC and my gut feeling was that he, he didn't say anything, but I though, no, DC's not going to be around. Anyway that's another story.

R: Okay, um a very open ended question, can you describe some of your responses and reactions to emails that you have received or um sent. If you have sent emails, not everyone sends What's your reaction when you see one of those emails popping up in your in your in your inbox, from Rob, you'll see it comes form me, does come up from me

J: Ja it does, well sometimes I defer it because sometimes they are things that I know that I am going to have to spend time thinking about. So I know, I know in the course of a busy day, it's often it isn't usually a one liner from you. It's normally going to include an attachment, it's got, some exemplars, or some documents or something I am going to think through. Its, its fine if I can see that it says in the subject line that its just like, for instance, notification of like a conference, then I quickly scan and see that its for Joburg then fine, but the moment I get the feeling its an exam or exemplar then I leave it for later, obviously PDFs take a long time to read. But I look forward to getting them I don't mind them at all.

D: My response is very similar because in our school we speak to each other with email, I mean people don't phone each other, something happens, so you don't have lots of time to read your emails, (inaudible patch) so you know I do look at it, I do see ,you whenever you send, and its good to have it. And sometimes its messages between, I remember one it was message from that person to that person; I don't know half the people so...ja.

P: In my case, I've got Linux so I can't read any of the attachments, so I have to forward on, I scan the list on my PC and if it is an announcement that I can read on the email itself, the I read it and then delete it and if its got an attachment and I think it might be useful to me then I forward it on to my home address and then have the leisure to read and print it if I need it there, if it's a website link usually I dump it unless it really piques my interest immediately then I dump it. Um the few times that it has piqued my interest it's been a huge blessing. I have downloaded whole PowerPoint shows as are from the net but it really has to be something that interests me if I am to pursue that link otherwise I dump them. It's only really the links and the interpersonal interchanges that I delete straightaway the other stuff I forward

J: What I've done with the links is, whenever, I've actually opened up a word file and whenever there's a link I actually copy it straight out and dump it into that word file. So now I have one page of Word that just got, just got links and usually people like Jenny will say I found this interesting site on genetics and I copy with it. So its not only the link but actually the preamble to the link, and its all in one place and then when we like hit exams and I have time, then I'll open up that page and say right lets go through these things and see what they really at.

R: Ja, ja, the ja (turning to D) when you said that everybody talks on email, so I mean, what's, you must um get hundreds of emails.

D: Ja, that's the problem, and that's why you don't have lots of time, to go and explore, to see, you want to be able to see exactly what it's about, would it be, phrases, you know worth looking into.

R: So you say that...

D: Deciding if it's important or not, one must decide

P: Sometimes its confusing a little bit because you, I, as a newbie in the IEB have no idea which grid I am going to nee for what, on top of that, I am an outcomes based beauracracy sceptic, so If I get forms that I got to fill in, generally I am binning them, unless it says there, P if you don't have this form for your grade 12 CTA you are dead

(laughter)

You know that type of thing, because I can't really be bothered um and also the people out there panic about syllabus and are constantly exchanging emails about which syllabus is more bobaas, generally speaking I am binning that stuff too as well because I know for a fact what ever is bobaas in 2006 will be completely different in 2008, necessitating that our, my decision for next year and my new staff member is going to bring internal syllabus stability to E-school, regardless what happens with WCED and IEB, there needs to be an element of internal stability, so I just don't see it as being stable.

R: Ja

P: and I also don't know which source is authoritative

R: Okay

P: which is a real problem for me, like you sending me this website has published new guidelines for this, now do I need to look at those, is looking at them going to just make me more confused

R: Ja I know

P: do I bin them, if I bin them, is J going to be cross with me

(laughter)

J: like the biggest oke I the cluster is scared of the smallest oke

P: So that's what I am saying there's a whole lot of that going on

R: So you touched on something, you said as a newbie, can you imagine what it would be, well I am trying not to lead the question but, if there hadn't been something like the Bio Teachers Network, you know 5, 4, 3 years ago, there was nothing like that, there was no kind of internet exchange, um, if you came in as a teacher then, what do you think your experience would have been, How different would it have been?

P: Ja, I think there have there have been times when it has really helped and I said that to you and I have actually emailed you that response. Um its helped me a lot with the lower grades, minor worthwhile assignments, being able to pull of a genetic test that's twice as good as mine and use it immediately, with a printed memo, WOW, that's a huge blessing for me, from the point of view of workload, but at the level of procedure and forms it can be murky, which one is the authoritative one.

R: Okay, um the other thing is, just now, um K when she left, she said oh it's good that we have these cluster meetings, because we get so isolated, now I want to read

you a quote and then you can just bounce some ideas of this quote. It says:
Educators are Islands of Excellence, with no ferry service to connect them, to each other or too groups of their peers. I'll read it again; Educators are Islands of Excellence, with no ferry service to connect them, to each other or too groups of their peers. What does that

J: I think we are largely all too busy to make face to face contact with people outside of your school, I mean you guys I see four times a year, and I never phone you in-between, its not to say that I wouldn't like to, I find these meetings always incredibly valuable, because you always sit down, there are certain things, you can only do face to face, they are incredibly valuable to do that, but when you can do that, you are an island essentially, and I think what you, what what your service is offering, it makes you, it makes you an island that gets provisions, in other words you are not really like a um, watch you call it, (castaway) like a um sole survivor, you are not like a castaway anymore, which is what you could be like, and certainly people have been like, you now are like a, like a castaway but you are getting provisions in and and its up you to obviously choose to decide what you are going to use and how you want to use it, but it is there and if you ever feeling like a castaway, you just send an email and you'll get a responses back, so I think, I think how well it works for you depends on how much you are willing to also get involved in this.

R: mmm

P: Ja I am also am tempted to say that, I can't say it much better than that, except to add that I think we also sometimes we are quick to underrate the amiability of these meetings, but I mean I've had, you know, my usual stress syndrome going on all week about this one and yet when I get here and um, and um its great and its collaborative and I learn, you know I find it, and its great and I walk away from it wondering what I was worried about, and I sometimes wonder if we don't as a Biology cluster underrate the warmth of the people that happen to make up the cluster, we don't have interpersonal issues, I think that's a huge blessing, one that we underrate very very easily, I think if we brought this whole group together for a braai, it would be amiable and fun. The cast away thing and the box bobbing on the beach is a great illustration of what the network is doing, I think that's a very nice visual image, and also my only argument is with the labelling of the really important boxes. (laughter in the background)

R: You have to open them to find out what's going on, what about some red boxes

P: I don't need chewing gum

J: I think if there was one major improvement that I could say it's that, that subject line is actually a vital thing, the subject line actually needs to be very particular with what's in that thing. That I think, well obviously you get a lot of these things you send them out and you just put a thing in the subject line that alludes to what's in there. I know for myself, if you had to spend another minute just working out exactly what that thing is all about it would also help me when I open up, because I never delete your emails, unless it's just stuff, I have another inbox or sub box saying it's Biology and all your stuff, once I have read it and I've used it just goes in there, if I go back there 6 months later and I look at the subject lines, now which one was it, then they all begin to merge because they are all quite similar, whereas if you were more particular about what was in there I could actually identify from the actual subject line.

P: I would like your subject line to start off by saying, something like um,

R: BTN email or.....

P: No, no, no I would like it to start off

J: like policy

P: that's right, policy, curriculum, curric, whatever and then if something is mandatory, maybe then mandatory need to be a, a, a thing, if it says mandatory, I am on it like a vulture

R: Especially for P

J: Yes P, dead

P: ja, (inaudible) once can play with it you can have dead, if it says dead I know, look, if I don't. I mean I found a mail from on your network yesterday from A and, cause I had done what you did, except I hadn't had time to read Rob's thing so there was a whole full on list of these things unread and I got a bit of open space, and I was working through, and there's one from A saying, don't deduct for the histogram on the CTA, well that's going to mean that I am going to have to go and back and mark my guys because I nailed them all for the histogram. They all used a line graph

J: Which it was meant to be

P: I didn't know it was in that set, I just left it untouched, If I had know it was there, if it had said "dead" I might have picked it up earlier

D: It should have been emailed in another way to the school

J: Your head of academics meant to have given it to you, cause it arrived as an email

R: It went through the IEB as well

R: Now it is interesting that you used A's name, now do you think, again, try kind of imagine a world (laughter) without the Bio Teachers Network, would you have known who A was, I mean I guess.....

P: I would have he was at Varsity with me, but, but....

R: Ja okay so there is a personal connection, but.....well

J: No, it certainly helped me to get to know, well I mean I've met JP, AP, whose names now roll of my tongue, like I know them well, I have only met them once or twice and I have seen them I have only seen them at marking and I and I've seen them at conference, but from that I would never have begun to realise, just what incredible work they are doing and what incredible research they are doing. And I mean the stuff they are sending out, so I am, if you say to me now James, we need to do something to do with genetics then I am going say get hold of, get hold of...

R: J or

J: get hold of JP, because like boy o boy she knows her stuff. I have only got that from your network

R: D?

D: Ahh (then silence)

R: Anything, I am just trying to give you a space

D: No, No Don't fell sorry for me I am listening, ja no it's fine

R: The um, we are near the end by the way, um this is, mm thanks. The, Well this is a kind of open question as well, have you had any other experiences with groups where you communicated via internet, and belonged to professional groups or hobby group or something like that, where you've had experience

J: No, none whatsoever

D: No, this is the first one and that's why it's unique in that way, you know to ask us to belong to this kind of group, it's the first time and I think that's quite good.

R: Ja

D: Cause, I mean, half these people like I said, I don't know them, we have one thing in common and that's that Biology

R: Yes

D: and that's quite good, you know

R: And does it ...P you want to say something?

P: No, no I would agree with that, It's my first one but it's also, it's generally speaking a pleasure

D and J: mmm

R: And the um, one of the things I tried earlier at the beginning, was a, was a yahoo based one, where you became part of a, and I'm part of a couple of these, but, basically its its, you sign up to yahoo and then yahoo, instead of me forwarding the emails, yahoo forwards the emails, and, none of you belong to anything like that?

P: No

D: No

J: I tried to sign up with that

R: Please move your hand

J: ja, sorry I tried to sign up for yours, but I never managed to get on it and make it work so yours is working fine

R: Ja

P: Ja, I agree with that, your systems better than that system and I wouldn't use a system where I had to log on and go to a site

J: Mmm, I wouldn't either, I wouldn't log onto a page

P: I wouldn't

R: Why not?

P: takes too much time

J: Its one extra step and the point is with email it tells me when something's arrived, I am not going to go opening up a site to see if something has arrived

D: (agrees)

J: It's a las

D: Also with our network and it depends you know on what time of the day you can go to that site

P: I know at E-school the firewall is so ugly that you know maybe they won't even let me on; they don't allow us onto Yahoo anyway so

R: Ja, well that's ja...

J: But for me the most important is I don't like looking to see if there is something, it, it. I must be notified when is something there for me, that's why I think the IEB website, none of us, I think,

D: I don't

J: use the IEB website, because, because, you only want to go there when something's new

R: But you never know

J: You never know when something's new, so you know to keep on checking, who's going to do that?

D: There is a teacher at my school that does that...but

J: Well I can see M does as well, well hats off, fantastic, good for you, I can't do that

P: I can't either

J: I only attend to t....

P: and I don't want to, I mean fundamentally I don't want to, I don't want to run around after someone else's website, where I've got to check and the I've got to enter a password, and then I don't know the password

J: and it's always WZT4 (laughter)

P: and then I look it up and in my admin system that means hours of searching for the piece of paper

D: yes it mustn't be that cumbersome, but I want to say thank you for doing this because it's an excellent, I mean it's obviously your time

R: mm, mmm

D: and energy and stuff

R: I can ask one more question just to round off, just to finish.

D: yes

R: We have, we have cluster meetings, we have the conference and I think we kind of answered this, so what's the point of having an email network if we see each other

D: We only see each other once, what or three times in a year maximum

J: We only see each other 3 times a year and also and also

R: You have colleagues who support you at school and that kind of thing

J: No but it's not the same, because you've got one or two colleagues but you

P: If you are lucky

J: If you're lucky, sometimes you don't, but also you don't necessarily have experts or you can have contact with other experts, I consider M an expert, so having contact with her provides me with extra stuff that I wouldn't necessarily get here, and hopefully from like also some other people, so also glean things from me, so you meet up with people who can support you sometimes with more than what you got

R: mmm What, what, ja that's fine

J: I am not sure; I have actually forgotten what the question was

Laughter

D: Why we needed conference

P: For me as well it's an instant solution and for me that's very important. I don't have the, especially me running SDR in parallel to my career, I don't have the time to dither around. If I have looked through my genetics file and I don't like the test I got and I want a new one, um the fastest way to get it is to email you and to say...you know what's going on and that email goes out...half an hour later I have got one from JP and I'm sorted. Um, and then I ah, I rarely send stuff back and hopefully the stuff I send back, there is someone out there who is prepared to be as quirky as me and will use some of my stuff, so the thing is for me its instant support, it means I can deal with my problem now, not next week, not in two weeks time.

J: Also I I it's a las if you want something from me, it's a las for me to say okay, ja rob fine, ja, I will get it for you, because ah flip the print rooms closed now, so sorry it I will have to give it to you the next time I see you, geez when am I coming out to Franschoek, no I am not sure when. Now if you want I say: "Sure first thing on Monday, I will email you and email with the document, cause its saved

D: Ja, that's right, I find that continuity after the conference

J: It's just

D: for example, still if people needed to get hold of things, after the conference

P: I also found your disc, just as a different expression of way of, expression the BTN. The conference by conference disc expression is exceptionally helpful.

D: Mmmm, I agree

P: I mean the PowerPoint shows that were on that disc that was issued, aah, you know, I virtually, I have used several of them

R: Mmm

P: and they've been great and I have translated several of them across into mobile... and we will use them for underprivileged schools and that type of thing, I mean also, different expression of the BTN but equally valuable.

R: Mmm, well that's great, thank, that's a good couple of hours of analysing and coding that we have to do.

J: It's a pleasure doctor in training

D; yes

R: thanks very much

6.3 Addendum 2: Analysis of Purposeful Sample of Emails

University of Pretoria– McKay, R. (2007)

Sender	Date	Content	L e v e l
JB1	2005/09/06 10:47 AM	Hi RM A question. Apart from the references to FET content on pages 32-40 of the Life Science NCS booklet, is anyone aware of any more official, detailed descriptions of content that I should be aware of. We too are going grey trying to decide on text books - each set of authors seem to have their own spin of what to cover ... and the depth that should be covered. At the moment therefore it looks like we're going to do our own material. Please distribute. Thanks JB1	5
SD	2005/09/07 06:36	We are writing our own material for the first year. During this year we will evaluate all new textbooks and make a decision for 2007. SD	3
MG	2005/09/07 09:12	Dear RM I have gone through all the sample books that have been sent and we have decided on the following syllabus (see attached document)to follow for Grade 10 FET. In the attached document you will see that there is a column showing where the content is presently being taught and the bolded writing indicates new work that must be covered. WE have decided on issuing "Life Sciences for the classroom" by Avis, Dawson and Heese. Publishers: Heinemann as it is a book with lots of exercises and little content. This gives us an opportunity to provide content to the pupils (making sure that we are still needed in the classroom!) and then applying knowledge etc.. with the activities in the book. WE realize that if this is not the best book that we will change it for the following year REgards	5
LB	2005/09/07 09:57	There is a resource document, based on what was given to the textbook writers, in its final stages of proof-reading which should soon be distributed on this group for comment. This suggests the content and depth for each section. LB	3
LB	2005/09/07 10:03	Another great thing about the mind action series is that you can get them	3

