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Minor Dissertation

**Viewing the use of Open Educational Resources through a
community of practice lens:
A case study of teachers' use of the Everything Maths and
Everything Science open textbooks**

Submitted in partial fulfilment of the degree
Master in Philosophy (Information and Communication Technologies in Education)

by

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Abstract

This study answers to the questions of why and how the “Everything Maths” and “Everything Science” open textbooks are used, and to what extent a Community of Practice (Wenger, 2006) has formed around the use of these open textbooks, are informed by a case study, comprising of interviews with nine South African high-school teachers using these open educational resources. The Community of Practice theory provided a useful lens through which to code, analyse and view utterances made. Findings indicate that while financial reasons for using the open textbooks are important, pedagogical reasons, of quality and scope of content, are more valued by teachers. Also important are the availability of the open textbooks in a variety of formats, the potential for teachers to develop social learning (Brown, 2008) skills, learners to study independently, the interactive features, and online availability of the open textbooks. A Community of Practice, while not formalised, exists around the use of these open textbooks and can be classified as an Active Community (Kim, Hong and Suh 2012).

Key words: Use of Open Educational Resources, open textbooks, community of practice, South African high-school Maths and Science teachers.

University of Cape Town

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A special thanks to my family and friends for their never-ending encouragement and support.

University of Cape Town

Declaration

I, Erna Theresa (Tess) Cartmill, hereby declare that the work contained in this dissertation is my own work, and that it has not been submitted for any degree or examination at any other university.

Signed:

Date: 29 January 2013

Declaration by candidate for the degree of Master in the Faculty of Humanities

I, Erna Theresa (Tess) Cartmill of 25 Amethyst Street, Stellenridge, Cape Town, do hereby declare that I empower the University of Cape Town to produce for the purpose of research either the whole or any portion of the contents of my dissertation entitled *Viewing the use of Open Educational Resources through a community of practice lens: A case study of teachers' use of the Everything Maths and Everything Science open textbooks* in any manner whatsoever.

Signed:

Date: 29 January 2013

Abbreviations

4Rs	Reuse, Revise, Remix and Redistribute
ACE	Advanced Certificate in Education
CAPS	Curriculum Assessment Policy Statements
CCOTP	Community College Open Textbook Project
CoP	Community of Practice
DOE	Department of Education
EM&ES	Everything Maths and Everything Science
FHSST	Free High School Science Texts
GNU	General Public Licences
HSRC	Human Sciences Research Council
HTML	HyperText Markup Language
IEB	Independent Examination Board
IT	Information Technology
OEP	Open Educational Practices
OER	Open Educational Resources
OP	Open Pedagogy
PC	Personal Computer
pdf	Portable Document Format
PIRG	Public Interest Research Group
SAIDE	South African Institute of Distance Education
TESSA	Teacher Education in Sub Saharan Africa
UCT	University of Cape Town
UNESCO	United Nations Educational, Scientific and Cultural Organization
USA	United States of America
WCED	Western Cape Education Department
XML	Extensible Markup Language

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1 Overview

1.1 Introduction to Open Educational Resources and the Everything Maths and Everything Science open textbooks

Teachers have been sharing resources informally for many years, but the technology enabled movement of formally sharing teaching and learning resources only emerged a little over a decade ago with teaching and learning materials being placed on the internet for use by others. The movement gained impetus when the Massachusetts Institute of Technology made most of their courses freely available to the rest of the world. Open Educational Resources is a term frequently used to describe these sharable resources.

The term Open Educational Resources (OER) was first suggested at the UNESCO conference in Paris in July 2002, after consideration of the alternatives of open courseware, open learning and teaching resources. According to the UNESCO report, the recommended definition of Open Educational Resources is: “The open provision of educational resources, enabled by information and communication technologies, for consultation, use and adaptation by a community of users for non-commercial purposes” (UNESCO, 2002:24). Atkins, Brown, and Hammond (2007), provide a comprehensive definition of OER: “OER are teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use or re-purposing by others. Open educational resources include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge.” (Atkins et al., 2007:4)

People across the globe have created and distributed OER with the intention of providing access to education for all (Johnstone, 2005). The idea of OER follows the lead of Open Source Software and, in 1998, there “was an attempt to apply the pragmatic arguments made in favour of open source software to educational materials” (Wiley & Gurrel, 2009:13). Various technologies have made it possible for the well-intentioned OER movement to become a potentially powerful enabler of education. Creation of OER in digital form is made possible by a range of information communication technologies and connectivity provided by the internet. Open licensing, such as Creative Commons¹ or the GNU General Public Licences² that allow free use of intellectual material by others, also assisted the legal sharing of materials. Storing and retrieving of OER is enabled by a variety of international and institutional repositories and the inclusion of descriptive metadata that conforms to international standards.

The potential of these OER would be wasted if they are not used to facilitate education in some meaningful way. Richter and Ehlers (2010) say that there are large repositories of OER available on the Internet, but these are not used as well as they could be. Other researchers have mentioned the desirability of investigating the use of OER. Johnstone (2005) says that designers of OER need to keep users in mind. The paper on OER by Yuan, MacNeill, and Kraan, (2008:15) refers to the need for researching the use of OER, whereas Petrides, Nguyen, Jimes, and Karaglani (2008:115) refer to the specific need for a better

¹ <http://creativecommons.org/>

² <http://www.gnu.org/copyleft/gpl.html>

understanding of how users interact with OER. In order to delve deeper in to the use of OER I will investigate how and why the Everything Maths and Everything Science (EM&ES) open textbooks are used and I will refer to the types of use of OER as have been described by Wiley (2009), namely: reuse, revise, remix and redistribute.

The intention of this dissertation is to investigate the use of the EM&ES open textbooks, which are OER, or more specifically, open textbooks, developed for South African secondary school, grades 10 to 12, Mathematics and Science (Physics and Chemistry). Open textbooks are a subset of OER containing content to cover a specified curriculum. Frydenberg and Matkin describe open textbooks as “digital and changeable” (2007:11). The EM&ES open textbooks are freely available online and are being used by South African high school teachers, with assistance available from the Siyavula³ team.

The use of the EM&ES open textbooks by teachers, and whether and if so, how, their use is being facilitated by participation in a community of practice, is the focus of the study. EM&ES were created and are supported by South Africans for South African Maths and Science teachers. The complex context is described next.

1.2 The context of South African Maths and Science education, textbook availability and the creation of Everything Maths and Everything Science open textbooks

South African education policy commentator, Bloch maintains that: “Education is the key to growing skills ... to design, plan and implement the changes we need to go forward ...” (2009:17). There is also an urgent need to extend these skills, and provide quality education, across the whole population, especially to disadvantaged communities in South Africa (Smith, 2010). Oloruntegbe, Akinsete, Ayeni, Odutuyi, and Alam (2010) emphasize the need for Science education in Africa, to address a variety of issues, including: food security, full use of natural resources, medicine, technology, transportation, communication and sanitation. They also say that capacity building and investment in training the next generation is essential for sustainability. As in the rest of Africa, Marshall confirms that we need science in the 21st century in South Africa to be able to “contribute to the fields of renewable energy, climate change, new economic systems, social development, and so on” (2009:76). Wolfenden, Buckler and Keraro (2012) confirm the resource challenges experienced by Sub Saharan Africa and simultaneously suggest that the potential for OER to change the status quo is substantial.

The South African education system has a variety of problem areas and Maths and Science are often identified as subjects needing assistance (Bloch, 2009). In an article discussing the 2010 matric results, the Human Sciences Research Council (HSRC) mentions its concern with the poor performance in Maths in South Africa (HSRC, 2011). In a study of the various factors affecting learning in South Africa, Smith (2010:21) found that certain pupils (those from quartile 3, where quartile 4 is the most advantaged and well-resourced group of schools) obtain much higher results if they have their own textbooks. In a newspaper article on the crisis in South African schools the authors, leaders in South African education, mentioned that the non-availability of textbooks was one of the factors contributing to the education crisis (Price & Clark, 2011).

³ <http://www.siyavula.com>

The EM&ES open textbooks which were originally referred to as Free High School Science Texts (FHSST) which were rebranded as the “Everything” series at the end of 2011 (Horner, 2011, December 5). The creation of FHSST was started in 2002 by post-graduate students at the University of Cape Town (UCT) after meeting with high school students who were studying Science and were interested in the subject, but did not have access to Science textbooks. The intention of FHSST was to provide “free and sharable” textbooks to high school students in the under-resourced areas of Science and Maths in South Africa (Petrides, Jimes & Nodine 2007). FHSST were collaboratively written and have been edited by experienced South African educators (Horner & Blyth, 2008). FHSST, and now the EM&ES open textbooks, consist of openly licensed digital texts, grouped logically to form textbooks, for Maths and Science, and cover the South African curriculum for Grades 10, 11 and 12. The EM&ES creation and updating is on-going and is supported by the Siyavula team, who also support teachers, and thus enable them to share open resources. According to the Siyavula website⁴ they build communities to support South African teachers and make educational materials available under open licence that can be adapted to suit teachers’ needs. These digital texts are currently available in English and the first translation into Afrikaans was undertaken in March 2011.⁵

The EM&ES open textbooks have their own repository⁶, or digital storage space on the Internet, that caters for authoring and placement of OER. In order for any use of the EM&ES open textbooks to take place, the repository needs to be available, reliable and easily accessible to both the creators and users of the OER. The users in this case could be teachers, learners or anyone in any part of the world with internet access.

1.3 Rationale for Dissertation

This dissertation builds on the research on the FHSST OER, undertaken by Petrides et al. (2007). Their research discusses the history and collaborative creation of the FHSST OER, while this study concentrates on the use of the FHSST OER, now EM&ES open textbooks, by South African teachers. Petrides et al. (2007) concluded that apart from the emphasis on localised content and usability, the FHSST project shows how the ability to facilitate a community of volunteers strengthened the project. Their research was done five years ago and the FHSST OER / EM&ES open textbooks have continued to develop using open and collaborative activities, as well as adopting technological innovations.

This dissertation includes, as background, a description of the current state of the EM&ES open textbooks and then investigates how and why the EM&ES open textbooks are used and to what extent a community of practice has formed around the teachers using the EM&ES open textbooks.

1.4 Theoretical and conceptual frameworks used in this dissertation

⁴ <http://projects.siyavula.com/>

⁵ We are very proud to announce our first English to Afrikaans translation in FHSST Grade 10 Maths!
<http://fb.me/WoxXakD2> 1:40 PM Mar 30th via Facebook

⁶ <http://everythingmaths.co.za/>

The Siyavula team's intentions are to facilitate communities of teachers sharing good practice⁷, so it seems appropriate that the theoretical lens through which this dissertation will view the research is that of a Community of Practice. Lave and Wenger coined the term, Community of Practice (CoP), while studying apprenticeship as a learning model (Wenger, 2006). Wenger provides the following definition: "Communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly" (Wenger, 2006:1). He lists the characteristics of Communities of Practice as having:

- a shared *domain* of interest and competence
- a *community* who share activities and information and
- a *practice* in which members of the community develop shared resources. Activities in the practice are undertaken to learn about or help others learn about the subject of mutual interest. (Wenger, 2006:1-2)

Within each of the three CoP groupings, domain, community and practice, the teachers' utterances will be categorised by various aspects of OER, namely, financial, technological, legal, social and pedagogical, as defined by Hodgkinson-Williams and Gray (2008). The "practice" of the CoP contains another area of focus of this study, that of investigating how the EM&ES open textbooks are used, via types of use, as described by Wiley (2009), and conceptualised as reuse, revise, remix and redistribute. Finally the extent to which a CoP (Wenger, 2006) has formed around the use of the EM&ES open textbooks, and the Type of CoP (Kim et al., 2012) that has emerged, will be discussed.

1.5 Research questions

The primary research question that frames this study is:

How and why do teachers use the Everything Maths and Everything Science open textbooks and to what extent has a community of practice formed around the use of the EM&ES open textbooks?

Subsidiary CoP questions that address aspects of the primary question include:

- *Domain:*
 - Why do teachers use the EM&ES open textbooks?
 - What are the teachers learning?
- *Community:*
 - Who constitutes the community?
 - How do they assist each other?
- *Practice:*
 - How do the teachers access the EM&ES open textbooks?
 - How do the teachers **reuse** the EM&ES open textbooks (copy, print, etc.)?
 - How do the teachers **revise** the EM&ES open textbooks to make them suitable to their context?
 - How do teachers **remix** the EM&ES open textbooks with any other materials?
 - How do teachers **redistribute** their revised or remixed materials to others?

⁷ <http://projects.siyavula.com/>

Additional questions:

- What challenges do teachers face using the EM&ES open textbooks?
- What benefits do teachers derive from using the EM&ES open textbooks?

1.6 Research design and methodology

The research is a case study which investigates the use of the EM&ES open textbooks by high-school Science and Maths teachers. I use Eisenhardt's definition of a case study: "The case study is a research strategy which focuses on understanding the dynamics present within single settings" (1989:534). She describes a case study as an in-depth analysis of a single setting, involving practices, activities, processes and perceptions to gain understanding of the specific setting. In the case of this study, the single setting is the teachers' use of the EM&ES open textbooks. The teachers were selected because they are among those teachers who use the EM&ES open textbooks, and because they volunteered to take part in the research.

Nine teachers, who use the EM&ES open textbooks, were interviewed using interview questions that flow from the research questions. While the questions were specific, I requested teachers to express any related opinions as I endeavoured to glean as much information and to encourage as much discussion as possible to enable a full understanding of the teachers' views around the subject. All interviews were transcribed and logically grouped and coded using the steps suggested by LeCompte (2000) as outlined in Chapter 3.

1.7 Importance of study

The results should be of interest to all stakeholders interested in high school Maths and Science education in South Africa. The study is currently relevant as textbooks are expensive and not affordable to many pupils (and where provided, costly to the state), and these subjects are a necessity in South Africa to aid growth and to keep up with technology. Science and technology are essential for sustainable growth in Africa (Oloruntegbe et al., 2010) and in South Africa (Marshall, 2009). It will be a bonus if the description of the use of the EM&ES open textbooks can serve as an example of a process that others can follow, in South Africa in particular. It would also be an additional benefit if this research introduces potential users to the EM&ES open textbooks.

1.8 Dissertation structure

Table 1.1 summarises the structure and content of this dissertation.

Table 1.1 Structure of dissertation

Chapter 1: Overview of dissertation	This chapter contains background information on the OER movement, open textbooks and the EM&ES open textbooks. South African education, and especially in Maths and Science, is high-lighted, as this is the context in which the EM&ES open textbooks are created and used. The focus of this dissertation, namely the use of the EM&ES open textbooks by teachers, and the theory and methods used, is summarised.
Chapter 2: Literature Review	Describes concepts of openness, OER, open textbooks and types of use of OER. Reviews previous research on OER and open textbook use. Summarizes the history and current state of the EM&ES open textbooks. Explores the concept of Community of Practice, which is the lens used to review research.
Chapter 3: Methodology	Defines the research methodology used in this study, namely: interpretive, qualitative, single case study using interviews.
Chapter 4: Findings and Discussion	Reviews results of coded utterances made by teachers during interviews and discusses findings, and analyses data, within a conceptual framework and in relation to other research.
Chapter 5: Conclusion	Summarises findings, indicates limitations of study, draws conclusions and lists recommendations for further study and action.

2 Literature Review

2.1 Introduction

The purpose of this chapter is to clarify the concepts, review the empirical studies and identify theoretical perspectives on the use of Open Educational Resources (OER) and, specifically, open textbooks which are a subset of OER. The particular set of open textbooks being referred to in this study, namely, the *Free High School Science Texts* (FHSST), which were rebranded as the “Everything” series at the end of 2011 (Horner, 2011, December 5) will be reviewed. An overview of the current state of the *Everything Maths* and *Everything Science* (EM&ES) open textbooks is included to complete the picture. Prior research surrounding the use of OER and open textbooks, and previous FHSST research, is explored, high-lighting the findings, methodologies and theories or conceptual frameworks used. Theoretical perspectives for this study will also be justified. Empirical studies exploring the use of open textbooks, especially in secondary schools and in the South African context, are limited; as a result I will also be referring to literature on conceptual thinking around the use of OER and open textbooks, some with reference to tertiary education, as this is where most of the concepts have been developed.

The order in which the discussion will take place is to first outline aspects of openness, then the concept of OER and, thereafter, open textbooks. Empirical research and conceptual thinking on topics, related to the use of OER and open textbooks, will be reviewed and ordered according to **why** open textbooks are used, **how** open textbooks are used, and **who** uses and enables the use of open textbooks. Within each of these sections I will examine the literature according to the five aspects of openness as used and/or defined by Hodgkinson-Williams and Gray (2008), namely Financial, Technological, Legal, Social and Pedagogical. Following that will be descriptions of the methodologies and theories used in the research reviewed. Thereafter I summarise: the history of the FHSST project, the current state of the EM&ES open textbooks, and FHSST research done by Petrides et al. (2007). The last portion of this chapter has an explanation and justification of the theoretical and conceptual framework used in this dissertation.

2.2 Key Concepts

2.2.1 Aspects of Openness

Various aspects of openness are discussed by Hodgkinson-Williams and Gray (2008), namely, financial, technological, legal, social and pedagogical openness.

Financial: The high cost of regular textbooks is often the reason why open textbooks are advocated (Frydenberg and Matkin, 2007). The high textbooks prices are still an issue for parents and students, as indicated by Li and Yuen (2012). Tuomi also views the economic factors from another angle and suggests that open resources can “increase in value when they are used” and this “puts open educational resources in a new economic context where resource scarcity is not a limiting factor, and where artificial scarcities may carry social costs” (2006:4).

Technology is the enabler for the creation and use of OER. Open standards and interfaces (Tuomi, 2006) as well as facilities for hosting and organising the OER and creating space for communities to form on websites (Davis, Carr, Hey, Howard, Millard, Morris and White, 2010) are all aspects of technology that make an OER movement possible. Hodgkinson-Williams and Gray (2008) list various systems used in education and show examples of those systems, tools, formats and resources that are considered open, for example, emails are less open than social media, a resource saved with a .pdf extension is less open than one saved in XML or HTML format, and a static electronic textbook is less open, technologically, than an open textbook which has interactive functionality and can be changed. Baraniuk (2008) explains that the Connexions hosting site encourages OER reuse by organising materials in modules, which then together form collections, which can be courses or textbooks.

Legally, while the learning or content management systems might be open source software, the resources, being accessed by these systems, also need to be open (Tuomi, 2006). OER are often licensed with one of the Creative Commons Licences⁸, with at least attribution given to the author(s) of the educational material. The vision of the Creative Commons organisation is to realise the potential of the Internet by providing universal access to research and education and the possibility of the culture of participation for all, and so to drive a new era of development, growth, and productivity. They add that: “Creative Commons develops, supports, and stewards legal and technical infrastructure that maximizes digital creativity, sharing, and innovation”⁹.

Social openness of OER is the philosophy that knowledge belongs to all, and is stated in the Cape Town Open Education Declaration (2007) which postulates that all people on this planet could be accessing and contributing to the knowledge of all humans. Social openness is thus the “culture of sharing” Brown (2008). The Internet and Web 2.0 platforms enable a “culture of sharing, augmented with a culture of participation” (Brown, 2008:xii). This in turn enables **social learning**, which involves not only learning about a subject but learning to be in the community surrounding a subject and becoming a participant (Brown, 2008). Tuomi explains that “openness in the social domain is fundamentally motivated by the expected social benefits and by ethical considerations related to human freedoms” (2006:9).

“Open Pedagogy” is a term defined by Hodgkinson-Williams and Gray (2008:3) to convey their belief that, while accessing the content of OER is important, Web 2.0 technologies will enable “the opening up of educational processes”, and this will hopefully guide students and lecturers towards more meaningful collaboration. Ehlers and Conole (2010) broaden the concept by describing not only the educational processes, but all the processes around OER, for example: governance, policy, management, education and learning, as Open Educational Practice. They give the following definition: “Open Educational Practices (OEP) are the use of open educational resources with the aim to improve quality of educational processes and innovate educational environments” (Ehlers and Conole, 2010:3). Included in their OEP activities are: Learners sharing content; quality review methods and strategies put in place, like peer-reviews; educational scenarios initiating learning; sharing and reviewing of learning artefacts; and the process of learning becoming an open process in which

⁸ <http://creativecommons.org/>

⁹ <http://creativecommons.org/about>

institutional boundaries are blurred. For the purpose of this dissertation I will use the term **pedagogical** openness to refer to both “open pedagogy” and “open educational practice” it will include the types of use of OER and activities that enable learning.

All aspects of openness, namely financial, technological, social, legal and pedagogical, enable and/or contribute to the creation and subsequent use of OER.

2.2.2 Open Educational Resources (OER)

A paper providing background to the UNESCO World Conference on Higher Education highlights the intention of the OER movement and the global collaboration by providing the following definition, which says that OER are “educational materials and resources offered freely and openly for anyone to use and under some licences to re-mix, improve and redistribute. They are the expression of an Internet empowered worldwide community effort to create a global intellectual and educational commons” (Balasubramanian, Clarke-Okah, Daniel, Ferreira, Kanwar, Kwan, Lesperance, Mallet, Umar and West, 2009:25). Tuomi’s definition also points to the educational value of open resources and suggests that OER can be described as “assets that generate services that enable the development of individual or social capabilities for understanding and acting” (2006:34). The Cape Town Open Education Declaration says the promise of OER is the opportunity “where each and every person on earth can access and contribute to the sum of all human knowledge” (2007:1) and Lane (2008) writes that the intention of OER is to make “educational materials a common or public good from which all ... can benefit” (2008:149). My definition of OER combines aspects of them all to read: *OER are educational materials intended to enable learning, by being free, open and universally accessible.*

The specific subset of OER that is open textbooks, is the focus of this dissertation.

2.2.3 Open textbooks

Open textbooks are digital versions of conventional textbooks that have been created, saved and made available, as OER. The concept of an open textbook is, however, difficult to define. Frydenberg and Matkin (2007:11) describe the open textbook as a continuum from a static digitized textbook to dynamic super open course materials (Figure 2.1). On the left is the physical digitized textbook placed on the internet for anyone to use. On the right is the most up-to-date interactive course imaginable.

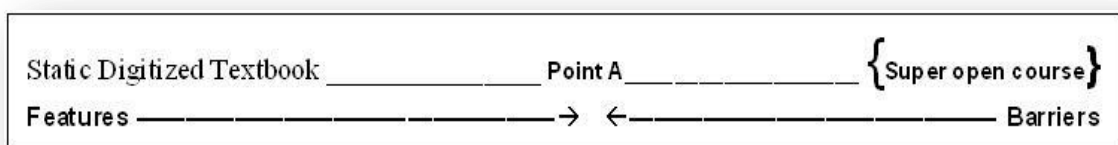


Figure 2.1: The Open Textbook Continuum (Frydenberg and Matkin, 2007:11)

They maintain that the problem is that when complex features are added, the cost and maintenance increase and these features become barriers. Point A, in Figure 2.1 is therefore the point on the continuum where the open textbook provides the best value. Frydenberg

and Matkin (2007:12) go on to explain the features of open textbooks, starting from the static digitized textbook on the continuum in Table 2.1: Firstly, digitized material is dynamic by nature and can be updated, improved, localized, customized, added to, extended, or added to other material. Following these primary features and moving in the direction of the super open course, there is an increased opportunity for student interaction and self-scoring examinations. Even further along the continuum, communities can be formed around the resources to enhance the learning experience. Thereafter meta-data can be collected to measure student outcomes and improve teaching outcomes and assist in teacher development. Finally supplemental resources can be incorporated to easily link to permanent web-based resources (Table 2.1).

Table 2.1: Increasingly useful features of open textbooks as described by Frydenberg and Matkin (2007:12)

Static digitized textbook		—————→				Super open course
can be updated, improved, localized or customized	can be added to, extended, or added to other material	increases the opportunity for student interaction and self-scoring examinations	allows for communities to be formed around the resources and thus enhances the learning experience	enables meta-data to be collected to measure student outcomes, improve teaching outcomes and assist in teacher development	easily incorporates links to supplemental resources which are permanent web-based resources	

Another reason for the creation of open textbooks is the affordability of textbooks, which is as big an issue as it has ever been (Li and Yuen, 2012) and, according to Prabhala and Caine (2004) textbooks in South Africa are the largest component of student costs.

Studies that have been conducted on open textbooks include: research on the price of textbooks in the USA (Allen, 2010); an investigation on educators' use of an open textbook, *Collaborative Statistics*, created in the pilot phase of the Community College Open Textbook Project (CCOTP) (Petrides, Jimes, Middleton-Detzner, Walling, and Weiss, 2011); research on the reuse of open textbooks, available via *Flat World Knowledge* (Hilton III, Wiley and Lutz, 2012); and research into the cost savings and learning impacts of using open textbooks in middle and high school science classes across 20 schools over two years (Wiley, Hilton III, Ellington and Hall, 2012). While not open textbooks, I also reviewed other related OER studies. Issack (2011) reviewed three online courses that included OER as a context for the sustainability of educational practices at the University of Mauritius. In a more localised context Wolfenden (2008) described the approach used in creating OER for a specific audience of users, in that case teachers, in the Teacher Education in Sub-Saharan Africa (TESSA) programme. Sapire (2010) analysed the uptake of OER created for Maths teacher education in a South African Institute of Distance Education (SAIDE) project. The aim of her study was to understand the use of the materials and "to gather data which could inform further development of the materials" (Sapire, 2010:166). Sapire and Reed (2011) conducted further analysis on the use of the OER created for the SAIDE project.

As using open textbooks is the focus of this dissertation, it is necessary to define the use of OER.

2.2.4 Use of OER

Use of OER is enabled by a variety of factors and Lane (2008) says that the use of OER should not only be established through counts of access to websites, but investigating how the OER are actually used. He points to the fact that ultimately learning needs to take place. Proving that learning has taken place is more difficult to ascertain, but Wiley (2009) has described “types of use”, which can be employed to analyse and evaluate how the OER are used, namely:

- Reuse – Use the work verbatim, just exactly as you found it
- Revise – Alter or transform the work so that it better meets your needs
- Remix – Combine the (verbatim or altered) work with other works to better meet your needs
- Redistribute – Share the verbatim work, the reworked work, or the remixed work with others.

In a later paper Wiley has, along with others (Hilton III, Wiley, Stein, and Johnson, 2010), related the “4Rs”, mentioned above, to degrees of openness where the least open is “reuse”, more open would be “reuse and redistribute” only, and finally the most open is using all the aspects of the OER, namely: “reuse, revise, remix and redistribute”. Hilton III et al. (2010:39) illustrate this increasing openness of use in Figure 2.2.

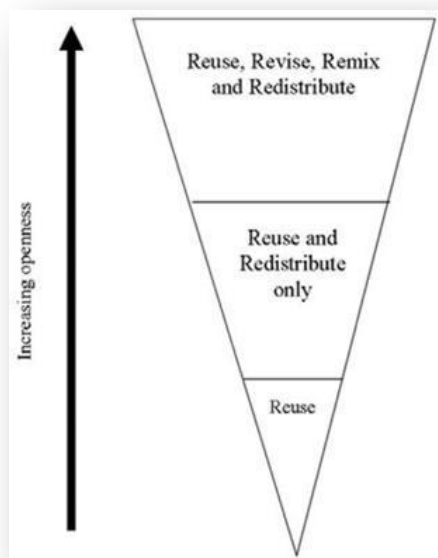


Figure 2.2: Increasing openness of the 4Rs (Hilton III et al., 2010:39)

OER projects, open textbooks and their use have been studied by various authors, and are reviewed in the next section of this chapter.

2.3 Prior studies

Drawing on literature published on related conceptual thinking and prior studies on open textbooks (Allen, 2010; Davis et al., 2010; Frydenberg and Matkin, 2007; Hilton III et al., 2012; Issack, 2011; Petrides et al., 2011; Sapire, 2010; Sapire and Reed, 2011 and Wiley et

al., 2012), this section reviews why, how, and by whom open textbooks are used for financial, technological, legal, social, and pedagogical reasons.

2.3.1 Why use open textbooks

Financial: A fundamental reason for using open textbooks is cost saving, which definitely is achievable if the open textbook has a defined audience of users. Petrides et al. (2011) found that possible cost savings was an attraction to their open textbook, while Issack (2011) found that the OER used in their study did reduce costs, and Sapire (2010) concluded that teacher education has the potential to gain, in reduced costs and time to develop materials, by using OER developed for specific courses. In a survey done on costs alone, Allen (2010:14) concludes that students using open textbooks can save 100% of their textbook cost by using the online version and about 60% by buying a printed copy. Wiley et al. (2012) included the cost of customising in their open textbook study and found that this could significantly increase costs, but identified a model that could reduce costs of using an open textbook to 50% less than that of an equivalent conventional textbook. In South Africa there is also a need to consider Tuomi's (2006) view that OER become more valuable as they are used, and, where economic resources are scarce it could be socially costly not to use OER.

Technology enables the use of open textbooks and Petrides et al. (2011) found that ease of use was one of the initial attractions and that students are particularly interested in improving interactive features of the open textbook they reviewed. Research from a few years ago suggests that the Internet and Web 2.0 technology is the enabler allowing the use of OER (Brown and Adler, 2008) and this still holds true. However, later research takes the Internet as a given and observes that open software enabling hosting, and well-thought out, continually improving websites enabling community activity and inspiring trust, are the current technologies enabling the use of OER (Davis et al., 2010). Nevertheless, there are areas where access to the Internet cannot as yet be taken for granted and Sapire and Reed (2011) found that making OER available digitally, in formats ready for printing, reached the largest audience.

From a **legal** point of view, open copyright licences allow for the OER to be freely accessible and are therefore reasons why we are able to use OER. The open licences make it possible for OER to be registered under, for example, a Creative Commons licence with Attribution, allowing anyone to use the OER, as long as they attribute the work to the original author (Frydenberg and Matkin, 2007). Frydenberg and Matkin also point out that one of the important dimensions of OER is that it has to be "Made very Available" (2007:4), which open licences allow.

Social reasons why people use OER vary from doing so for the collective good to those required for personal growth. Developing countries have the potential to gain from the use of OER as Issack (2011) concluded from his study in Mauritius. Another possible gain for those involved in OER is the potential for collaborative development and knowledge sharing that exists in using open textbooks (Petrides et al., 2011). Sapire and Reed (2011) found that OER were more likely to be used and adapted where lecturers had the autonomy to design their own courses and / or their own pedagogic approaches. Participation in the creation of the resource (Wolfenden, 2008), as well as the fact that a resource was created with a specific audience in mind (Sapire, 2010), are also reasons for using OER.

Pedagogically, the likelihood of OER being used increases if the material is of high quality (Sapire and Reed, 2011:209). Sapire and Reed also observe that “materials designed with clear learning pathways ... encourage use” (2011:209). The quality of the content of the OER studied by Issack (2011) and the fact that the required learning was achieved are the reasons he suggests why the OER in his study can be used. Frydenberg and Matkin (2007:10) stress that high quality textbooks are essential to improve education. They also suggest that how quality is addressed needs to be done at the outset of an open textbook creation project and use **FHSST** as an example of how educators using the OER can provide feedback which is then used to continually improve the quality (Frydenberg and Matkin, 2007:20-21). Wiley et al. (2012) found that despite research showing that making notes in textbooks is an effective learning strategy, conventional textbooks have to be preserved for future use and this is why using open textbooks could have a worthwhile educational outcome, as long as students are able to annotate their books.

2.3.2 How open textbooks are used

How open textbooks are used, can have different **financial** implications. Sapire (2010) indicates that using a full set of course materials, as-is, could result in the biggest time and cost saving. Wiley et al. (2012) found that the time spent doing adaptations could prove to be very costly, and this activity could have an end result of an open textbook being more expensive than a conventional textbook. They go on to explain that choosing not to print, and have only online versions of the textbook, reduced costs, whereas printing loose-leaf pages, for filing, of the open textbook increased costs to higher than a paperback open textbook. Wiley et al. suggest that the best way to save money when adopting open textbooks, in print format, is to: revise the open textbook and remove all unnecessary information; use a print-on-demand vendor to print black-and-white paperback copies; not split the book into smaller sections; and print relatively large numbers (2012:270).

Technology is available for the use of open textbooks and different technology solutions, for how they are used, can be found. With reference to the TESSA project Wolfenden (2008) focused on technological aspects of how OER could be used, suggesting that an adaptable template be used for creation of the OER, which provides for standardisation and ease of creation, while at the same time making it easier to localise content for each of the member countries, and thus enabling use. Hilton III and Laman (2012) suggest students can access and use open textbooks from anywhere, for example, a library, a laptop or an internet enabled phone, and they can link directly to videos and additional material and post this supplemental material to their learning management systems, making the open textbook more available for studying and, for example, a safeguard against lost or forgotten books.

Legally, the fact that open textbooks are openly licensed allows for freedoms not possible with copyrighted textbooks. Hilton III and Laman (2012) recount how the college in their study was able to place appropriate supplemental material to the open textbook on their internal website, thereby allowing easier access for students, than the alternative of trawling publishers' websites.

From a **social** perspective, Issack (2011) concluded that the OER model would require constant experimentation and refinement, but that using OER increased student access to

learning materials. Wolfenden (2008) suggests that the use of the OER needs to be built into a project which creates OER. She says that ideally the OER creation is a collaborative development, with the users being the developers. Bruns explains that it is “no longer sufficient to describe participants in these collaborative endeavours simply as ‘users’; instead, they act in a hybrid role of user as well as producer, or for short, as produsers.” (2007:2).

Pedagogically: A framework to study how OER are used was first defined by Wiley (2009) as “types of use”, or the 4Rs, and later more fully described by Hilton III et al. (2010). Various authors have used similar terms (Table 2.2).

Table 2.2: Types of Use as defined by Wiley (2009) and how others have used the terms

Authors	Types of Use				
		Reuse	Revise	Remix	Redistribute
Wiley (2009) (included are the definitions in brackets)		Reuse (Use the work verbatim, just exactly as you found it)	Revise (Alter or transform the work so that it better meets your needs)	Remix (Combine the, verbatim or altered, work with other works to better meet your needs)	Redistribute (Share the verbatim work, the reworked work, or the remixed work with others)
Sapire (2010)		Reuse	Rework	Remix	Redistribute
Connexions (Baranuik, 2008:233)	Create		Rip	Mix	Burn
Downes (2007:32 quotes Foote (2005) who defines "Four Freedoms")		Freedom to copy	Freedom to modify		Freedom to redistribute and Freedom to redistribute modified versions
Brown and Adler (2008)	Create	Use		Remix	
During the interviews for this study I used the terms:		Use as-is	Adapt	Combine	Share

Reuse appears to be how most OER are used and Hilton III et al. (2012) explain that the *remix* and *revise* activities in their study, and other open textbooks examined, was relatively low. When OER are created for a specific audience (Wolfenden, 2008; Sapire, 2010) it is most realistic to use them as-is, but Sapire’s (2010) study also shows that materials can be customised to suit specific needs and that adding material to existing courses was also practical. Hilton III et al. interpret their finding, that most customisations that take place are deletions, to the fact that educators “prefer shorter textbooks tailored specifically to their course design” (2012:55).

2.3.3 Who uses and enables the use of open textbooks

While government budgets for education can certainly benefit, Li and Yuen (2012) mention that educators, parents and learners could benefit **financially** if they were free to use open textbooks. Hilton III and Laman (2012) suggest that open textbooks can contribute to learning, as even students who can't pay have a textbook from day one. The latter statement relies on the condition that they have the necessary device and internet connectivity.

Strategies for using **technology** and OER, including open textbooks, in schools could come from education authorities, school management, and educators. Reasons for introducing this strategy are the availability of technology in the form of internet, laptops, web-enabled mobile phones, and thus the continual availability of the study material (Hilton III and Laman, 2012). Brown and Adler (2008) describe various situations where technology enables Communities of Practice to form thus allowing learning to take place. The "Minds on Fire" article by Brown and Adler (2008:28) includes a diagram, Figure 2.3, depicting how the teachers can share knowledge in an open environment, enabled by technology. In the diagram Brown and Adler (2008) advocate an "Open Knowledge Exchange Zone" or the provision of a "venue for sharing experiences / evidence to improve practice" where educators can **create** "representations of pedagogical knowledge", **use** and review or critique peers' work, and learn from others, and **re-mix** or incorporate others' knowledge into their own (p28).



Figure 2.3: Text illustration by Haviland in Brown & Adler (2008:28)

Educators and creators of open textbooks need to be aware of the **legalities** surrounding open copyright licenses and how they are used (Frydenberg and Matkin, 2007).

Social: OER enables those interested in **social learning** to do so. Brown and Adler (2008) discuss social learning and say that learning to master knowledge in a specific field requires more than just learning about a subject, but learning by actually being a participant in the

field of study. “This involves acquiring the practices and norms of established practitioners in that field or acculturating into a community of practice” (Brown and Adler, 2008:19).

Research by Wiley et al. (2012), suggests that students who used the open textbooks academically performed on par with, or better than, those using conventional textbooks. Other **pedagogical** influences were described by Sapire and Reed (2011) who observed that lecturers found that OER afforded them the opportunity for independent study and lecturer learning. The TESSA project in Wolfenden’s (2008) study specifically involved “teacher learners” in the creation and use of the OER, so that the teachers are learning while using the OER. The adaptation of the TESSA OER is evaluated by Wolfenden et al. who stress the value of the “underlying pedagogy” of OER (2012:1).

2.4 Approaches and methodologies used in other studies

Studies from outside Africa:

- The study by Allen (2010), to investigate possible solutions to the high cost of textbooks, conducted by the Student Public Interest Research Groups (StudentPIRGs), was a “**survey** of 1428 students from 10 colleges ... and an analysis of prices of textbooks for 10 common college subjects” (Allen, 2010:9).
- Petrides et al. (2011) say that the main research objective was to understand adoption and use of open textbooks and they undertook their research using **interviews, focus groups** and **surveys** with teachers and students who used online textbooks. Data collection in the pilot phase of the project was used to assess “open textbook adoption and use patterns” (Petrides et al., 2011:41), while the implementation phase data collection was used to “build on those findings with a larger group of participants across multiple disciplines” (Petrides et al., 2011:41).
- Wiley et al. (2012) studied teachers and the adaptation and printing costs of open textbooks used. “Seven middle- or high-school science teachers in the state of Utah replaced their commercial text books with open textbooks for one academic year” (Wiley et al., 2012:264). Teachers customized and supplemented the open textbooks as they would normally do with conventional textbooks. They **tracked the logged activities** of teachers and analysed printing costs and time spent adapting and customising the open textbooks.
- Hilton III et al (2012) **analysed data collected by Flat World Knowledge** systems which were used to track the reuse, remixing and revision done on open textbooks in that repository.
- Hilton III and Laman (2012) **initiated a pilot project** at Houston Community College where they, in conjunction with lecturers, made an open textbook one of the textbooks available for a psychology course, and they **recorded** the comparative up-take and costs.

Studies that include Africa/South Africa:

- Wolfenden (2008) gives a **personal account** of the TESSA project and substantiates her discussion with a review of literature around OER and the use of OER.
- In a later project, Wolfenden et al. (2012) used **interviews** with contributors to evaluate the adaptation process of the TESSA OER.

- The methodology used by Sapire (2010), when investigating the use of the Advanced Certificate in Education: Maths (ACEMaths) courses, was to conduct a qualitative practice-based case study which consisted of individual cases at different institutional sites. **Interviews, follow-up conversations, classroom observations and open-ended questionnaires** were used to collect data. **Artefacts**, such as assignments and adapted versions of the ACEMaths materials, were also analysed. Coded data and content analysis of themes across cases “contributed to the findings of the study” (Sapire, 2010:166). In a later study, Sapire and Reed (2011) analysed data from the ACEMaths project from a different angle.
- Issack (2011) showed how OER were included in a teaching and learning model, at the University of Mauritius. The OER were created with the intention that they would lead to a sustainable and innovative model. OER use was **observed** and **monitored** via “experience and feedback” (Issack, 2011:8).
- Petrides et al. (2007) conducted a case study on the creation of FHSST, using a participatory research methodology, where the Institute for the Study of Knowledge Management in Education (ISKME) collaborated with the FHSST team to develop research and data collection tools, giving value and weight to the insights and perspectives of the FHSST team members. Petrides et al. (2007) conducted three initial phone **interviews** and then one hour long semi-structured face-to-face interview to gain knowledge about the history, the then current state, the key successes and challenges of the FHSST project. They emailed 10 volunteers on the FHSST project, six of the ten responded to the **survey**, and two were selected for follow-up interviews.

Most of the studies mentioned, used case studies as the method to conduct their research, as I will be doing in this dissertation.

2.5 Theoretical and conceptual frameworks used in other studies

The developers and implementers of the ACE Maths materials in the project studied by Sapire (2010) formed a Community of Practice (CoP), which will require continual nurturing to sustain it. Sapire (2010) uses the CoP theory as Wenger described it in a 2007 paper. A variety, of models of use of OER, emerges from the study and are analysed by the types of use defined by Wiley (2009), namely reuse, revise, remix and redistribute. Sapire and Reed (2011) also use CoP, but add constructivism as a theoretical lens with which to review the quality of the content of OER created. No theories are mentioned in the write-up of the research on the CCOTP by Petrides et al. (2011), but the collaborative nature of the project could have allowed it to be viewed as a CoP. The other studies reviewed also did not refer explicitly to any theoretical lens or framework.

Conole, Galley, and Culver (2011) considered various theoretical frameworks for evaluating the use of a social networking site, *Cloudworks*, for academic practice. One of these was Community of Practice (CoP). They found that CoP had been used by others to evaluate networked learning. They also say that CoP is an example of socially situated theory of learning where learning happens via participation. They find Wenger’s (1998) theory valuable in that it looks at how CoPs are formed and developed, addresses the idea of belonging, considers legitimate participation, and provides a way to describe online interactions. They also maintain that while CoP does not easily lend itself to “codification or

participant assessment”, it does provide “a generic, descriptive approach for contextualising community formation and identity” (Conole et al, 2011).

The focus of this dissertation is the use of a particular OER, namely the EM&ES open textbooks. What follows is a brief history, what the books are like now and a summary of previous research conducted on these OER.

2.6 Everything Maths and Everything Science (EM&ES) open textbooks

2.6.1 History of Free High School Science Texts (FHSST) / EM&ES

Petrides et al. (2007:8) tell the story that led to the creation of FHSST:

In March 2002, Mark Horner, a graduate student in physics at the University of Cape Town (UCT), presented a demonstration on waves at a science fair in South Africa. After the demonstration, several high school students approached him, explaining that they did not have a science textbook, and had never had wave phenomena described to them before. The students had pooled their money to purchase a notebook and pen, and they asked Horner to write down the demonstration, step by step, so they could share the notes with their classmates and teachers. Wanting to give the students more than the steps of a wave demonstration, Horner returned to UCT and engaged his colleagues in writing a high school science text that would be free and sharable for all teachers and learners in South Africa. In the process, Free High School Science Texts (FHSST) was born.

Now, a decade later, the learners’ needs are unchanged, and Mark Horner and his Siyavula team are continuing with the development of open textbooks, while keeping up to date with technology and curriculum changes. Some of the FHSST / EM&ES / Siyavula milestones are depicted in Table 2.3.

Table 2.3 FHSST / Siyavula / EM&ES milestones

A few key events in the life of an open textbook series		
2002		FHSST is born – written by volunteers with post-graduate subject knowledge (Petrides et al., 2007).
2007	Oct	Siyavula starts as Shuttleworth Foundation project (Siyavula, 2008, April 14)
2008	Nov	FHSST v0 released (Horner, 2008, November 14) and resides on the Connexions repository (ITnewsAfrica, 2008).
2010	Sep	Siyavula was approached by the South African Department of Education to make the Siyavula open textbooks available on the department’s website to offset some of the effects of the teachers’ strike --- and a world-wide collaboration of editing the books proceeded. (Nash, 2010, September 13).
2011	Jul	Grade 10 Maths textbook translated into Afrikaans (Nash, 2011, July 11).
2011	Dec	Siyavula Education Pty (Ltd) - a social enterprise is born - with investor backing (Horner, 2012, August 8)
2011	Dec	FHSST rebranded to "Everything" Series and Everything Maths and Everything Science have their own websites (Horner, 2011, December 5)
2011	Dec	EM&ES open textbooks were printed by the Department of Basic

	Education (Grobbelaar, 2012, July 3) for all SA learners doing Maths and Science for Grades 10 - 12, for the school year starting in January 2012.
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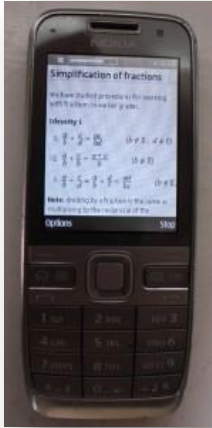
2.6.2 Current state of the EM&ES open textbooks

The EM&ES open textbooks consist of a series of Maths and Science textbooks, for Grades 10, 11 and 12, aligned to the South African curriculum and are written by volunteers, who are academics, educators and industry experts. The authors' names are listed at the start of each book. Examples of the textbook covers are shown in Figure 2.4.



Figure 2.4: Maths and Science textbook covers from the open textbooks downloaded from everythingscience.co.za and everythingmaths.co.za

The EM&ES open textbooks are available as printed copies and online and can be read on PCs, laptops, tablets and mobile phones (Grobbelaar, 2012, June 22) and during 2012 the Siyavula webbooks (including the EM&ES open textbooks) were made available on *Mxit* (Grobbelaar, 2012, July 10). Figures 2.5a and 2.5b show that the open textbooks are available via various mobile phones.



Figures 2.5a and 2.5b: Mobile phone availability as shown on the Siyavula website (Grobbelaar, 2012, July 3)

The EM&ES open textbooks are openly licensed and anyone has the freedom to copy them (Figure 2.6).



All of our textbook content (text and images) is available under the terms of the [Creative Commons Attribution licence](#).
 Embedded videos, simulations and presentations are not necessarily, please check their licence.
 All rights are reserved for content delivered by the Intelligent Practice service.

Figure 2.6 Open license – Creative Commons By-Attribution¹⁰

The books printed by the Department of Education are licensed with the Creative Commons license of Attribution – No Derivatives, acknowledge the authors, use the book as you like, but do not change the book, the cover or short codes (Figures 2.7a and 2.7b), as is shown in the front of a book downloaded from <http://everythingscience.co.za/>.



Figure 2.7a. Freedom to copy : everything-science-grade-10.pdf

¹⁰ <http://everythingmaths.co.za/>



Figure 2.7b. Attribution-NoDerivatives : everything-science-grade-10.pdf

Apart from the text, the EM&ES open textbooks are media enriched by the use of applicable links to other selected OER in the form of videos, presentations and simulations. Also linked to the EM&ES open textbooks is an assessment bank called *FullMarks*, with questions and answers, which is being built up by educators.¹¹ The *Annotate* feature is available to allow feedback on errors, or give suggestions, and in so doing enable the EM&ES open textbooks to be constantly improved (Zietsman, 2012, April 16). A recently added (low cost) premium *Intelligent Practice*¹² service allows individual learners, or schools, using computers or mobile phones, the opportunity to practice answering questions and monitor their progress.

The FHSST OER previously resided on the Connexions¹³ repository. According to ITnewsAfrica (2008), quoting Mark Horner, Siyavula decided to use the Connexions platform for the FHSST OER, and not build their own, as the solution already existed in a like-minded open environment. Building on this solid platform would also be more cost-effective and give the initiative a better chance at being sustainable. The EM&ES open textbooks now have their own websites and are freely available for reading or download from <http://everythingscience.co.za/> and <http://www.everythingmaths.co.za/>, and for mobile phones at <http://m.everythingscience.co.za/> and <http://m.everythingmaths.co.za/>, and through *MXitReach*¹⁴ under: everythingmaths and everythingscience (Grobbelaar, 2012, July 3).

In addition to being the custodians of the EM&ES open textbooks and keeping up to date with technology and curriculum changes, the Siyavula team supports South African educators by providing free technical training workshops around the use of open licences, social networking, blogs and other tools. Siyavula encourages the formation of a community of people who want to share knowledge and expertise with like-minded individuals and educators, and lead various volunteer projects, for example, around collaborative authoring and translations. By training these volunteers they then have a base from which to draw for future collaborative content creation projects.¹⁵

2.6.3 Previous research on FHSST

The study of the building of the FHSST OER and findings by Petrides et al. (2007) is the foundation on which my dissertation is built.

¹¹ <http://projects.siyavula.com/technology-powered-teaching/>

¹² <http://projects.siyavula.com/technology-driven-learning/>

¹³ <http://cnx.org/>

¹⁴ <http://www.mxitreach.org/>

¹⁵ <http://projects.siyavula.com/community/>

Petrides et al. found that FHSST are an example of an OER “project that started with a vision for improving education, based on an articulated need and demand, through the creation of free high school textbooks” (2007:19). They also suggest that the project has the potential to provide access to quality educational content to South African teachers and learners. On a wider level they found that “FHSST can serve as a model for peer production of open content” (Petrides et al., 2007:19). They then discuss the implication of the FHSST project to the field of OER under the following four themes:

Experimentation and Adaptation

A key finding of Petrides et al (2007) was that “creating and sustaining OER is an iterative, experimental, and adaptive process” (p20) catering for changing environments, matching volunteer skills to technologies, and redefining their processes when required. The implications of these findings include the importance of putting structures and practices in place (around technology choices, peer production practices, funding models etc.) that are aligned to project goals which can be adapted and iteratively changed (Petrides et al., 2007).

Culture of Collaboration and Support for Volunteer Engagement

Experience on the FHSST project shows that both face-to-face and online forums are necessary to share the project vision and benefits with volunteers in order “to convert interested volunteers into more active volunteers” (Petrides et al., 2007:21). Other essentials are establishing a community feeling and urgency around the project. This involves replicating the “benefits of face-to-face interactions within the content authoring platform” (Petrides et al., 2007:21) for which the project website becomes a central mechanism.

Top-Down, Bottom-Up Facilitation

FHSST focused on two parallel strategies for creating textbooks: “(1) bottom-up: ensuring that the texts were relevant, easy to understand, and adaptable to local needs; and (2) top-down: ensuring that they adhered to South Africa’s curriculum guidelines” (Petrides et al., 2007:21). Relating this to other OER projects, Petrides et al. point out the importance of answering the question of how to integrate and mediate local user needs and higher level structure requirements, “so that content is relevant, usable, adaptable and sustainable” (2007:22).

Using Resources from the Community: Find, Leverage and Learn

Petrides et al. also relate how the FHSST project used whatever resources they could to reach their goal of “creating free and open quality texts, while at the same time doing it quickly and more efficiently” (2007:22). They say that FHSST did this by using volunteers, open source technology, teaching notes and by recruiting of teachers and other experts to help with editing and writing. FHSST also leveraged an opportunity when junior engineers from a South African chemical company offered their assistance as part of the company’s corporate mission to contribute to the advancement of education. These engineers created “much-needed chemistry content for the textbooks” (Petrides et al., 2007:22) in a full-day “hackathon” (a day of co-ordinated writing to create content for the open textbooks) at their offices.

The *conclusions* that Petrides et al. (2007) drew from their case study on FHSST, for other similar OER projects, high-lighted the importance of localisation, usability, facilitating a community of volunteers, high quality content, and technological and practice improvements.

A collaborative work culture necessitates the creation of face-to-face and online mechanisms. Petrides et al. (2007) found that the implications for project sustainability involve replicating the practices around the characteristics of specific OER. Finally, as a guide to other OER projects Petrides et al. point to the “necessity of developing community-centred technologies, processes, and cultures that can support experimentation, self-assessment, and adaptation, while maintaining and continuously reinforcing a clear sense of overall mission” (2007:22-23).

The research by Petrides et al. (2007) reviewed the initial FHSST project (now EM&ES), whereas this study will concentrate on the teachers’ use of the EM&ES open textbooks. The framework for this study follows.

2.6.4 EM&ES compared to open textbook features

Table 2.4 compares the previously discussed characteristics of open textbooks by Frydenberg and Matkin’s (2007:12) and the complying characteristics of the EM&ES open textbooks.

Table 2.4 Characteristics of open textbooks (Frydenberg and Matkin, 2007:12) compared to characteristics of EM&ES open textbooks

Open textbook characteristics as described by Frydenberg and Matkin (2007)	Everything Maths and Everything Science compliance	Comments
can be updated, improved, localized or customized	√	
can be added to, extended, or added to other material	√	
increases the opportunity for student interaction and self-scoring examinations	√	Available to access via laptops, mobile phones and Mxit. Learners can reach Siyavula via facebook and twitter. EM&ES are linked to the FullMarks assessment bank
allows for communities to be formed around the resources and thus enhances the learning experience	√	Communities are promoted by the Siyavula team
enables meta-data to be collected to measure student outcomes, improve teaching outcomes and assist in teacher development	√	Available via the new premium, but low cost, Intelligent Practice service
easily incorporates links to supplemental resources which are permanent web-based resources	√	Links in EM&ES open textbooks to videos, simulations and other presentations

While Frydenberg and Matkin (2007) could not have foreseen all the possibilities for development in the last five years, their description of the characteristics for open textbooks to comply with is still very relevant and the EM&ES open textbooks measure up very well.

2.7 Conceptual and theoretical framework for this dissertation

The theoretical framework used in the analysis of data is the Community of Practice (CoP) theory devised by Lave and Wenger (1991) and updated and summarised by Wenger (2006).

Wenger (2006) says that communities of practice are relevant in education, especially in activities which enable professional development. “Communities of practice are formed by people who engage in a process of collective learning in a shared domain of human endeavour” (Wenger, 2006:1). He goes on to explain that learning in the CoP can be incidental or intentional. He states that when the CoP is identified and named it can aid in understanding the surroundings in which the CoP operates. Lave (1991:65) suggests that learning takes place as a result of “becoming a member of a sustained community of practice” and the knowledge gained as “mastery” of the subject around which the community has formed. She also says that learning happens as a result of “legitimate peripheral participation in communities of practice” (Lave, 1991:81). “Partial participation of newcomers” (Lave and Wenger, 1991:37) is welcomed and dynamic, with newcomers slowly learning about the shared subject of interest. Lave and Wenger (1991) explain that as the person learns more about the subject of interest, their membership of the community evolves. They argue further that the way in which the community practices and the artefacts are produced both need to be transparent for increasing participation by members (1991). They also suggest that participation in the practice “may well be a *condition* for the effectiveness of learning” (1991:93). Lave and Wenger (1991) hold the view that members of a CoP have multiple levels of participation and make diverse contributions to required activities.

The main characteristics of a Community of Practice, illustrated in Figure 2.8, are described by Wenger (2006:1-2) as:

- **Domain:** The interest shared by a group of people and their commitment to the interest.
- **Community:** Those sharing the interest, and building relationships and interacting with each other in order to learn from, or assist, each other.
- **Practice:** Activities undertaken to learn about, or help others learn about, the subject of mutual interest.

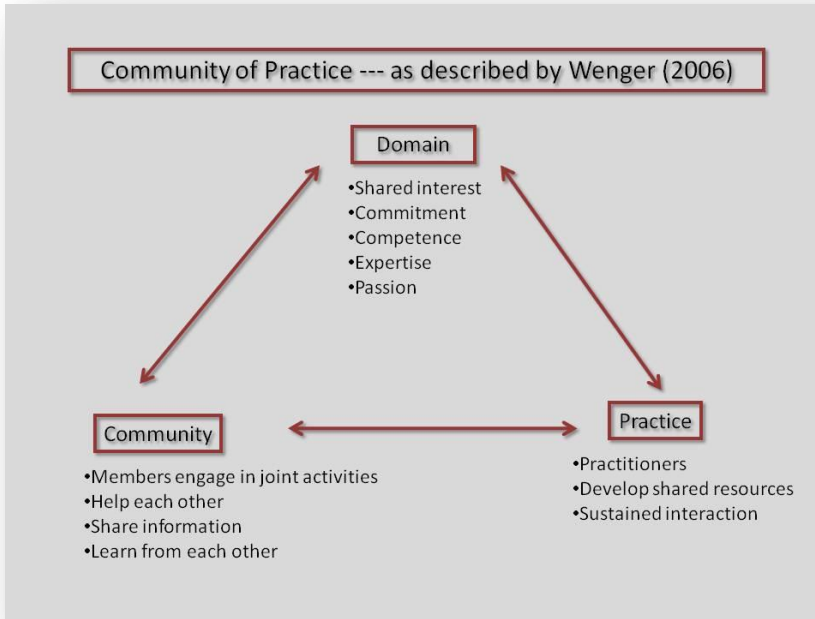


Figure 2.8: CoP: a diagram illustrating the description by Wenger (2006)

Characteristics or advantages of belonging to CoP are described by Brown and Adler (2008) as: learning to participate while learning about a subject; finding an online niche of people sharing a passion in a field of study; learning can be informal and reflective; and learning is supported by collaborating with virtual or physical newcomers and professional practitioners or scholars.

Kim et al. (2012) devised a mechanism for evaluating the state of a CoP. They observed the activities of individuals to ascertain whether they were mostly “knowledge propagating” or “knowledge receiving” (2012:13098). Various other factors were added to identify the individual’s participation in a CoP (Figure 2.9).

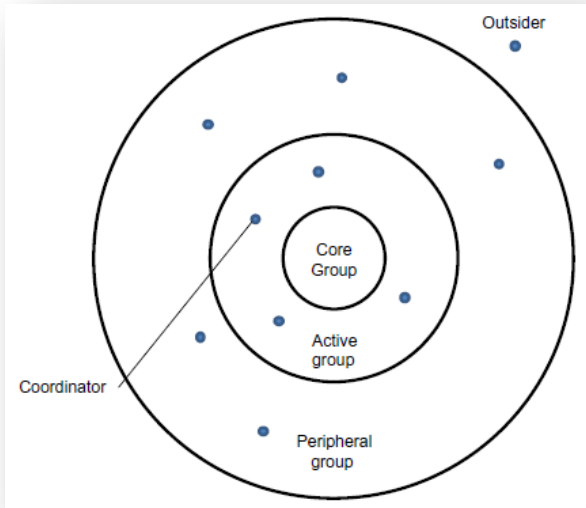


Figure 2.9: Degree of community participation (Kim et al., 2012:13098 citing Wenger et al., 2002)

Kim et al. (2012) then defined the Type of CoP (Figure 2.10) according to the knowledge sharing, receiving or propagating, of various individuals or groups in a CoP, which shows that where there are members propagating knowledge on the one hand, and receiving knowledge on the other, an Active Community can be defined.

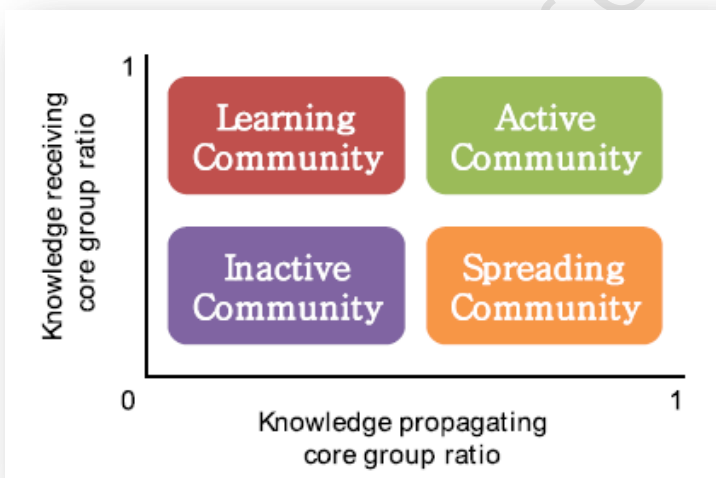


Figure 2.10: Types of CoP (Kim et al., 2012:13098)

The theory of Community of Practice as defined by Wenger (2006) will be the theoretical lens through which this dissertation views the research done into the use of the EM&ES open textbooks by the teachers, including Lave and Wenger's (1991) concept of legitimate peripheral participation. The CoP as it emerges will be related to Kim et al.'s (2012) definition of Types of CoP.

There are a variety of domains of knowledge, in which the teachers are, or could be, interested, as depicted in (Figure 2.11) which shows the potential Communities of Practice to

which teachers could belong. In the diagram the red circles indicate the domain, community and practice of the CoP lens through which this dissertation will view the teachers' use of the EM&ES open textbooks. The domain is the knowledge of the EM&ES open textbooks, the community consists of the EM&ES users and creators, and the practice is the EM&ES creation, access and use, with the latter being the focus of this study. There are, however other CoPs at play in the same space. The diagram shows the implied CoP of the OER community in blue, with the domain being OER, the community consists of users and creators of OER, and the practice is the creation, access and use of OER. The final implied CoP, shown in green, has the domain of Maths and Science teaching in South Africa, the community is made up of teachers, education authorities and textbook publishers, and the practice is teaching, training, curriculum development and textbook publishing. It is not possible to separate these domains, communities and practices from each other, as there are overlaps of interest and activities, as shown in Figure 2.11.

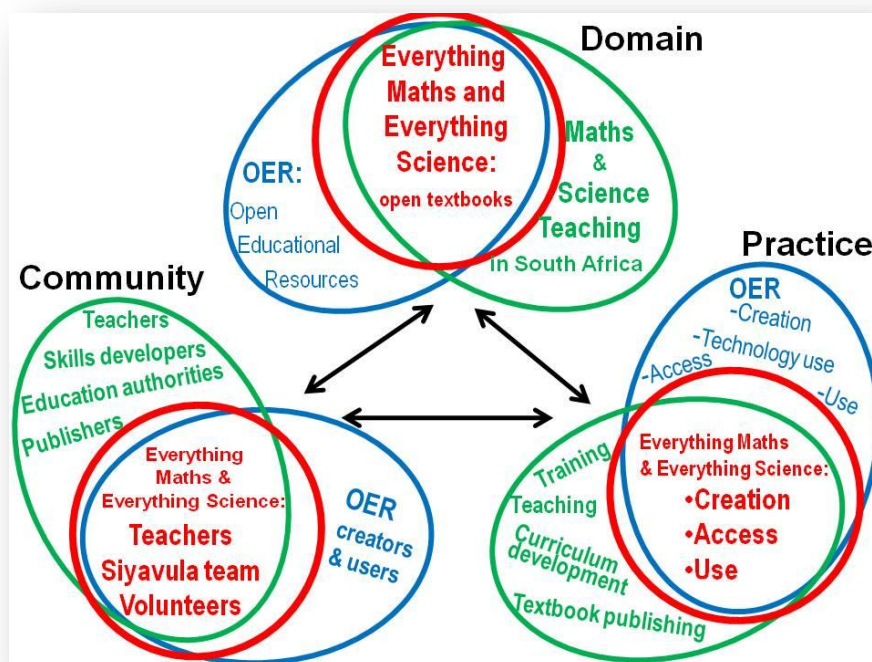


Figure 2.11: Communities of Practice influencing the context of this dissertation

The use of the EM&ES open textbooks is a small part of the EM&ES CoP, but this is the part that is the main focus of the research in this dissertation. Figure 2.11 shows the complexity of defining a CoP for this dissertation.

Aspects of openness, namely, financial, technological, legal, social, and pedagogical openness, together with the CoP lens, form the conceptual framework (Table 2.5); included are concepts around OER and open textbook use.

Table 2.5 Conceptual Framework: Community of Practice with aspects of openness

	Financial	Technological	Legal	Social	Pedagogical
Domain: (Why use open textbooks)	Cost reduction; social cost of not using OER; sustainability	Use enabled; interactive features; hosting websites enabling community activity; print ready formats	Open licences; open access; attribution	Developing countries gain; collaboration; knowledge sharing; individual interest; purpose created OER;	Quality content; annotate; feedback ensures quality
Practice: (How open textbooks are used)	Cost reduction methods; optimal printing methods	Standardisation; access anywhere at anytime	Freedom of use	Collaborative development; producers (creators are users);	Reuse (use as-is); Revise (adapt); Remix (combine); Redistribute
Community: (Who uses and enables use of open textbooks)	Cost benefit by parents, teachers and learners	Knowledge sharing enabled by technology	Awareness of copyright required	Social learning	Self-study

2.8 Chapter summary

This chapter discussed the concepts relevant to this research, namely, aspects of openness, OER, open textbooks, and the use of OER. FHSST / EM&ES, previous research on the FHSST OER, and studies with similar subject interests, were reviewed.

Methodologies and theories, or conceptual frameworks, used in previous and similar studies were explored and the theoretical and conceptual framework used in this dissertation was explained, while research methods for this study are described in the next chapter.

3 Research Methodology

3.1 Introduction

The purpose of the research undertaken for this dissertation is to investigate teachers' use of the Everything Maths and Everything Science (EM&ES) open textbooks and establish to what extent a community of practice has formed around the use of EM&ES open textbooks, a subset of open educational resources (OER).

This chapter covers the research orientation, types of research, and methodology, as well as the selection of sites and participants, and the data collection and analysis methods. Finally validity and ethical issues and the research procedure are discussed, ending with a short summary and identification of emergent issues.

3.2 Research orientation

The orientation of this research is *interpretive* as this tradition has “meaning” as its central focus (Maxwell, 2005:22). [Maxwell (2005) uses the word *interpretive* and Biggam (2011) uses *interpretative*, and I will use the words interchangeably, depending on the author whom I reference.] According to Biggam interpretative researchers believe that there could be a variety of “interpretations of reality” (2011:137) depending on the time and context of making these interpretations. Biggam goes on to say that fundamental to the interpretative researcher is “human participation and observation” (2011:138). The focus of “human interpretations of events leads interpretative research to be identified ... with qualitative research” (Biggam, 2011:138).

The reason for using an interpretive approach in this research is the participation of teachers in the study, via interviews, while I endeavoured to understand how and why they used the EM&ES open textbooks and to what extent a community of practice has formed around the teachers' use of EM&ES open textbooks.

3.3 Type of research

This is a qualitative study due to the need for an in-depth and exploratory approach required to understand the scenarios in which the teachers find themselves. Qualitative research's strength is derived from its focus on people and the situations in which they find themselves, and its “emphasis on words rather than numbers” (Maxwell, 2005:22). Maxwell also describes five intellectual goals that can be achieved by using qualitative research:

1. To be able to understand the “*meaning*” of the scenarios that participants find themselves in (from their point of view).
2. To be able to understand the “*context*” in which the participants act, and how this context influences the participants' actions.
3. To be able to identify phenomena and influences that were *not anticipated*, and potentially create new theories.
4. To be able to understand the “*process*” around the research scenarios.
5. To be able to develop “*causal explanations*” (2005:22-23).

These flexible intellectual goals lead to three practical goals made possible by qualitative research, as described by Maxwell:

1. "Generating results and theories that are understandable and experientially credible"
2. "Conducting formative evaluations" which could improve an existing process
3. "Engaging in collaborative ... research with ... research practitioners" (2005:24).

Qualitative research is the most appropriate type of research for this study as it focuses on specific scenarios and actions by a specific set of people, namely the teachers using the EM&ES open textbooks.

3.4 Research approach / methodology

The research approach adopted was a case study which investigated the use of the EM&ES open textbooks by nine high-school Science and Maths teachers. I used the description of a case study as an in-depth analysis of a single setting (Eisenhardt, 1989) as a starting definition. Cohen, Manion & Morrison (2007) add to the definition by describing case studies as an opportunity to analyse "a phenomenon in its real-life context" (Cohen et al., 2007:254), which in this study, is the teachers' use of the EM&ES open textbooks.

Thomas (2011) makes a distinction between the subject and the object of a case study in the following definition:

Case studies are analyses of persons, events, decisions, periods, projects, policies, institutions, or other systems that are studied holistically by one or more methods. The case that is the subject of the inquiry will be an instance of a class of phenomena that provides an analytical frame - an object - within which the study is conducted and which the case illuminates and explicates (Thomas, 2011:513).

He says the subject can be identified in one of three principal ways:

- local knowledge case, or a
- key case, or an
- outlier case (Thomas, 2011:514).

I consider the use of the EM&ES open textbooks by teachers to be a key case, or an example.

Thomas maintains that the "object constitutes ... the analytical frame within which the case is viewed and which the case exemplifies" (2011:515). The object in this study is therefore the community of practice lens through which the teachers' use of the EM&ES open textbooks is viewed.

Biggam advises that a distinct choice be made between single and "multiple case studies" (2011:119). In this dissertation there are interviews with nine teachers relating to their individual ways of using the EM&ES open textbooks, but the object of the study is the community of practice forming around the teachers' use of the EM&ES open textbooks, which then makes this a single case study. Thomas supports this by saying that there can be more than one element in the subject of a single case study (2011:517).

Biggam suggests that there are three types of case studies, namely: "*explanatory, descriptive and exploratory*" (2011:119-120). He describes them as follows:

- Explanatory: Explaining why something happens.
- Descriptive: A description of an event or scenario.

- Exploratory: Informative case studies generally geared towards future study.

This research is an exploratory case study, as I strive to find out how and why the teachers use the EM&ES open textbooks and how a community of practice is forming around the teachers' use of these books.

Thomas (2011:518) defined a topology for a case study in Figure 3.1.

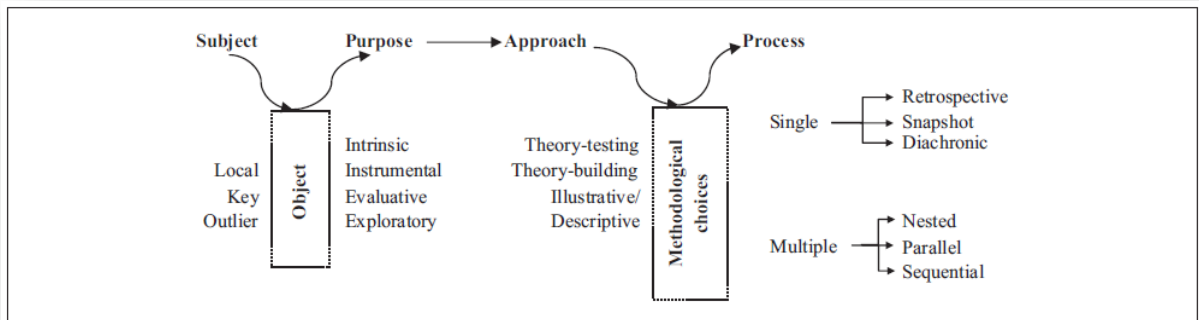


Figure 3.1: Topology of a Case Study (Thomas, 2011:518)

Using Thomas' topology in Figure 3.1, the case study used for the research in this dissertation could be described as follows: A single, key, exploratory case study, using snapshot data collection, in order to fully describe teachers' use of the EM&ES open textbooks and to what extent a community of practice has formed around this process. Specifically, using the descriptors from Thomas' topology, the case study in this research will comprise of:

- Subject: Key case (use of the EM&ES open textbooks)
- Object: Community of Practice lens
- Purpose: Exploratory
- Approach: Descriptive and Theory-testing
- Methodology: Interviews
- Process: Snapshot view of a single case.

3.5 Site and participant selection

The teachers were selected because they use the EM&ES open textbooks to teach Maths or Science to Grades 10, 11 or 12 learners, and because they agreed to take part in the research. The introductions to the interviewees are described and depicted in Figure 3.2. The Siyavula team introduced me to Roger [all teachers' names have been changed] who started using the EM&ES open textbooks at School B, and then transferred to School A, where I interviewed him. Roger in turn introduced me to the Principal of School B, who introduced me to Andrew and Lindiwe, whom I interviewed at School B. Roger also introduced me to Amien from School A. The Siyavula team also introduced me to Ivor, the technology director at School C, where I then interviewed Ingrid, Harold, Ann, Evelyn and Renier. I therefore interviewed 2 teachers individually at School A, 2 teachers together at School B, and 5 teachers in a group at School C.

While the Siyavula team also introduced me to other teachers, I decided to use these three schools as School C had made the strategic choice to start using electronic textbooks, School B decided to use the EM&ES open textbooks for economic reasons and School A had received the EM&ES open textbooks from the education department, as part of a nationwide distribution of printed copies.

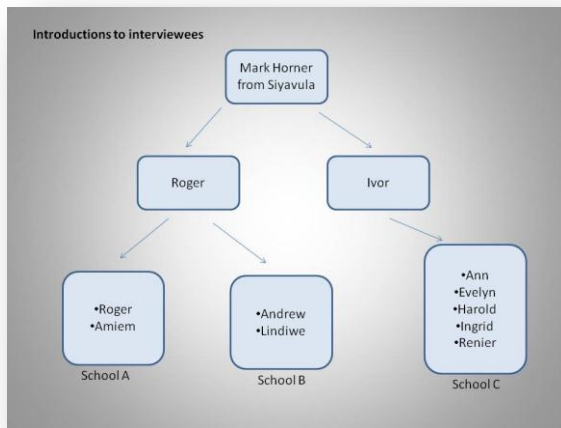


Figure 3.2: Introduction to interviewees

The teachers were chosen as a “snowball” sample, which Cohen et al. (2007:116) describe as a sample where a few interviewees are identified and they in turn introduced me to other appropriate interviewees.

The teachers are located in various provinces of South Africa, but as it is such a small sample this cannot be used as a reason for generalising the findings across south Africa.

3.6 Methods of data collection / generation

The type of interview I used is termed by Cohen, Manion and Morrison to be a “Standardized open-ended interview” (2011:353). Cohen et al. describe the characteristics of this type of interview as having the “exact wording and sequence of questions” pre-determined and that all the “interviewees are asked the same basic questions in the same order” (2011:353). The strengths of this type of interview are described as: enabling responses to be compared, complete data being obtained for all interview topics, reducing interviewer bias, permitting review of evaluation instrumentation, and facilitating “organization and analysis of the data” (Cohen et al., 2011:353). The weakness of this type of interview are: not allowing flexibility “to particular individuals and circumstances” and that the “standardized wording of questions may constrain and limit naturalness and relevance of questions and answers” (Cohen et al., 2011:353). The latter I hoped to mitigate by allowing interviewees to talk freely, and contributing issues they deemed relevant.

The data collection method that I used was recorded discussions that were obtained from face-to-face interviews. I also received an artefact, a sample *FreeMind* screen-shot, that demonstrated the use of the EM&ES open textbooks along with other electronic resources, and a follow-up email. The intention was to interview teachers who use the EM&ES open

textbooks, using interview questions that flowed from the research questions. The interviews were semi-structured as I had a specific set of questions, but also encouraged the teachers to talk freely or add any additional thoughts at any time during the interview. The interviews were recorded and transcribed. Teachers received the transcriptions and I received corrections from one teacher, but the rest were satisfied with my transcriptions. I asked the teachers whom I interviewed, to send me emails as a follow-up adding anything they had forgotten or any thoughts they had around using the EM&ES open textbooks.

I viewed the use of the EM&ES open textbooks (using Types of Use - reuse, revise, remix and redistribute – as defined by Wiley (2009)) from the perspective of a community of Practice lens (Wenger 2006). I also used the key concepts in the Community of Practice theory, i.e. community, domain and practice, as a broad frame for my key research questions (Table 3.1).

University of Cape Town

Table 3.1: Theory and questions

Research Question: <i>How and why do teachers use the Everything Maths and Everything Science open textbooks and to what extent has a community of practice formed around the use of the EM&ES open textbooks?</i>			
Theoretical construct:	Use of EM&ES open textbooks in a CoP	Subsidiary Research questions:	Interview questions (with asking sequence):
Lave and Wenger's Community of Practice as described by Wenger (2006) is the theoretical lens through which the data obtained in this study is viewed.	Domain <ul style="list-style-type: none"> ➤ EM&ES open textbooks ➤ OER ➤ Science and Maths teaching ➤ SA Education 	<ul style="list-style-type: none"> ❖ Why do teachers use the EM&ES open textbooks? ❖ What are the teachers learning? 	<p>Why are you using the EM&ES open textbooks? (3) <i>(Prompt if necessary)</i></p> <ul style="list-style-type: none"> ➤ To improve Maths and Science teaching? ➤ Because they adhere to the SA curriculum? ➤ Because you want to enhance the books? ➤ Any other reason? ➤ Benefits and challenges of using the EM&ES open textbooks? <p>What are you learning by using the EM&ES open textbooks? (10) <i>(Prompt if necessary)</i></p> <ul style="list-style-type: none"> ➤ How to use the EM&ES open textbooks? ➤ Alternative ways to teach? ➤ Ways to overcome financial constraints? ➤ How OER or open textbooks can work? ➤ How collaboration can overcome issues? ➤ Benefits and challenges around learning? ➤ Anything I haven't mentioned about your learning in this field?
	Community <ul style="list-style-type: none"> ➤ Siyavula team ➤ Teachers ➤ Schools ➤ Learners ➤ Education authorities 	<ul style="list-style-type: none"> ❖ Who constitutes the community? ❖ How do they assist each other? 	<p>How did you find out about the EM&ES open textbooks? (1)</p> <p>How are you assisted, or do you assist others, in the use of the EM&ES open textbooks? (5) <i>(Prompt if necessary)</i></p> <ul style="list-style-type: none"> ➤ Assistance from the Siyavula team? ➤ Assistance to and from other teachers? ➤ Ideas to encourage use? ➤ Do the learners know that you use an open textbook? ➤ How do the learners participate? ➤ Have you mentioned the mobile (cell) phone connection to the learners? ➤ Benefits and challenges of assisting or being assisted? ➤ What do you think of Government supporting the introduction of the EM&ES open textbooks to schools?

	<p>Practice (general)</p> <ul style="list-style-type: none"> ➤ Introduce teachers to the EM&ES open textbooks ➤ Access Connexions ➤ Teach 	<p>❖ How do the teachers access the EM&ES open textbooks?</p>	<p>How do you access the EM&ES open textbooks? (2) <i>(Prompt if necessary)</i></p> <ul style="list-style-type: none"> ➤ Printed copy? ➤ Online? ➤ From a mobile phone? ➤ Benefits and challenges around access? <p>How are you using the EM&ES open textbooks? (4) <i>(Prompt if necessary)</i></p> <ul style="list-style-type: none"> ➤ As the only textbook? ➤ An additional textbook? ➤ For some of the links to videos and simulations? ➤ Supplementary for advanced students? ➤ Benefits and challenges around how you use the EM&ES open textbooks?
<p>The 4 Rs of Wiley (2009) is the conceptual framework used to study the practical use of the EM&ES open textbooks.</p>	<p>Practice (focus)</p> <ul style="list-style-type: none"> ➤ Reuse, revise, remix and redistribute 	<p>❖ How do teachers reuse, revise, remix or redistribute the EM&ES open textbooks?</p>	<p>How do you reuse (as-is) the EM&ES open textbooks? (6)</p> <ul style="list-style-type: none"> • Do you have copies of the textbooks printed? (Example?) • How do you go about printing the EM&ES open textbooks (or parts thereof)? <i>(Prompt: Benefits and challenges around as-is use?)</i> <p>How do you adapt the EM&ES open textbooks to make it suitable to your learners' needs? (7)</p> <ul style="list-style-type: none"> • Do you have any examples of how you changed or enhanced the the EM&ES open textbooks? <i>(Prompt: Benefits and challenges around adaptation?)</i> <p>How do you combine the EM&ES open textbooks with any other materials? (8)</p> <ul style="list-style-type: none"> • Do you have any examples of how you combined the EM&ES open textbooks with other material? <i>(Prompt: Benefits and challenges around combining?)</i> <p>How do you share the version of the EM&ES open textbooks that you adapted with other teachers? (9) <i>(Prompt: Benefits and challenges around sharing?)</i></p>

A pilot interview was conducted with a teacher who had used the EM&ES open textbooks and this enabled me to review the questions asked.

The questions finally posed were:

1. How did you find out about Everything Maths or Everything Science?
2. How do you access Everything Maths or Everything Science?
3. Why are you using Everything Maths or Everything Science?
4. How are you using the Everything Maths or Everything Science open textbook?
5. How are you assisted, or do you assist others, in the use of Everything Maths or Everything Science?
6. How do you reuse (as-is) the Everything Maths or Everything Science textbooks?
 - Do you have customised copies of the textbooks printed? (Example?)
 - How do you go about printing the Everything Maths or Everything Science textbooks (or parts thereof)?
7. How do you adapt Everything Maths or Everything Science to make it suitable to your learners' needs?
 - Do you have any examples of how you changed or enhanced Everything Maths or Everything Science?
8. How do you combine Everything Maths or Everything Science with any other materials?
 - Do you have any examples of how you combined the Everything Maths or Everything Science material with other material?
9. How do you share the version of the Everything Maths or Everything Science that you adapted with other teachers?
10. What are you learning by using Everything Maths or Everything Science?
11. Is there anything else that you would like to add?

I sent the questions to the teachers before the interviews and also printed them so that the teachers had a hardcopy of what I was going to ask, in front of them. I asked the teachers to speak freely as I wanted to get their thoughts without too much interruption, and only asked occasional questions to clarify matters in-between. The prompts in Table 3.1 were used very infrequently.

Questions asked of teachers, during face-to-face interviews, intended to explore how and why the EM&ES open textbooks were being used and subsequently the extent to which a community of practice had formed around the teachers using the EM&ES open textbooks.

3.7 Data analysis methods

All interviews were transcribed and the data logically grouped and coded. LeCompte (2000) advises that the data be copied, ordered by date of creation, logically collated in more than one view, catalogued, labelled, and indexed. Data should then be reviewed, and gaps identified and filled. Thereafter the data items must be coded, counted and assembled into research results. LeCompte (2000) also advises that stable sets of items must be created, patterns created, structures assembled and finally data must be credible and useful.

The data was collected using a small, unobtrusive, recording device and I saved the podcasts onto my personal computer. Then I transcribed the interviews into *Word* documents, one for each interview. These transcriptions included the questions with question numbers and I also added line numbers to the documents, and to find my way I

added the minutes and seconds (in brackets, in red) on the podcast. Thereafter I anonymised the transcriptions, by changing all the teachers' and schools' names. An example of a transcript is attached as Appendix E. Then I copied the transcriptions to an *Excel* spreadsheet and placed one utterance per row. Where there were discussions not relevant to any of the topics, I did not copy them to the coding spreadsheet. Columns were used to place the utterances into logical groupings. Figure 3.3 is an example of a question asked.

98 TC: Let's go to why you are using Everything Maths and Everything Science

99 Ingrid: Well to start with we do have a one-to-one laptop program in the school and it clearly
 100 makes sense to not be buying a whole lot of additional heavy textbooks, when they have
 101 laptops (TC: so the digital ... electronic reason) So it makes sense given the direction that
 102 the school is taking. But on top of that the embedded ... the media enriched aspects. I have
 103 been able to show podcasts and video clips, and things like that, that do enhance the
 104 lesson. And we have the technology to do that so it just makes sense to be doing it. You
 105 know we can search YouTube for our own clips, but to have had somebody else ... you've
 106 got this huge mass of stuff out there ... so to have had other people who have already
 107 trawled and found the best ... it's a huge help.

108 Harold: (12:10) Just to go back a little bit. I look forward to the day when we've got the end
 109 product. I think ... 90% has been great, but there has been that 10% where we've been
 110 struggling with the variety of questions and answers etc ... that type of stuff. Why am I using
 111 it? We are an IT based school and that's the way forward for us and that's one of the big
 112 reasons we are using it. I don't just use Everything Science per se, I've got many textbooks
 113 that I use as well, but that is my main format that I am using, and it's because the learners ...
 114 because we're IT based, and that's the way forward, that's one of the reasons we're using it

Figure 3.3: Excerpt from transcription of interview 2

Figure 3.4 depicts how the same example was coded.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N		
1	Questi	Cc	d	Sch	Intervi	Utterance	reference	Inter	vie	Pa	line	Community	of Practice	STFLP	categories	sub category
117	3	why use	D	C	Ingrid	Well to start with we do have a one-to-one laptop program in the school and it clearly makes sense to not be buying a whole lot of additional heavy textbooks, when they have laptops. So it makes sense given the direction that the school is taking.	Ingrid,Int2,Page:3,lin e:99-102	Int2		3	99-102	Domain	Technology		use enabled	
118	3	why use	D	C	Ingrid	But on top of that the embedded ... the media enriched aspects. I have been able to show podcasts and video clips, and things like that, that do enhance the lesson. And we have the technology to do that so it just makes sense to be doing it.	Ingrid,Int2,Page:3,lin e:102-104	Int2		3	102-104	Domain	Technology		interactive features	
119	3	why use	D	C	Ingrid	You know we can search YouTube for our own clips, but to have had somebody else ... you've got this huge mass of stuff out there ...	Ingrid,Int2,Page:3,lin e:104-106	Int2		3	104-106	Domain	Technology		surfeit information	
120	3	why use	D	C	Ingrid	so to have had other people who have already trawled and found the best ... it's a huge help.	Ingrid,Int2,Page:3,lin e:106-107	Int2		3	106-107	Community	Social		Social learning	support from Siyavula
121	3	why use	D	C	Harold	I look forward to the day when we've got the end product. I think ... 90% has been great, but there has been that 10% where we've been struggling with the variety of questions and answers etc ... that type of stuff.	Harold,Int2,Page:3,li ne:108 -110	Int2		3	108 -110	Domain	Pedagogy		not enough Q&A and practise exercises	
						We are an IT based school and that's the way forward for us and that's one of the big reasons we are using it. I don't just use Everything Science per se, I've got										

Figure 3.4: Coded excerpt of sample from interview 2

Logical groupings of utterances included the spheres of a community of practice, namely: domain, community and practice. Under Domain was included the EM&ES open textbooks, Maths and Science teaching, OER and technology. Practice included use as-is, adapt, combine, share, access and teaching practice, while Community included teachers, schools, learners, the Siyavula team and education authorities. More detail of the sub category groups and sub categories can be found in Table 4.2 (Chapter 4). When analysing the data I used the pivot, filter and graphing features on *Excel* to obtain depictions of the most frequently occurring themes in the utterances. Themes and categories, with an exemplary answer for each, can be found in Appendix F – Coding Examples.

The interviewees spoke freely, and many questions could have been categorised in more than one place, but when that happened I placed them in the category most closely related to the question asked. When referring to the EM&ES open textbooks, teachers often spoke of the Siyavula books, or e-books, or just “the books”. Any other books used are indicated as such.

3.8 Validity and ethical issues

Maxwell discusses two specific threats to the validity of qualitative research, namely researcher bias and reactivity (2005:108). I address these two as follows:

- *Bias*: As I am not a teacher, or part of the Siyavula team, I am not biased towards either of those two groups, although I admire them both. I am however a South African citizen with a deep concern for the education of the nation. I am also very excited about the possibilities that open educational resources have for greatly enhancing the educational experience in this country, by being available and affordable. Personal bias potentially affected categorising and coding of utterances, but hopefully my awareness of bias helped me to code and categorise as objectively as possible.
- *Reactivity*: I am confident that I was able to let the teachers talk freely around how they use the EM&ES open textbooks and thus was able to gather data about the use of the EM&ES open textbooks and the community of practice in a relatively impartial manner. I am also a mature student, and have learnt to allow people to have their say.

Maxwell (2005:109-114) also provides us with a checklist of strategies to counter validity threats and increase the credibility of conclusions made. I have used this checklist as a framework to explain how I endeavoured to counter the validity threats and increase the credibility of my conclusions.

1. Intensive, Long-Term Involvement

Time constraints unfortunately did not enable me to become as involved with participants as would have been ideal, but I did ask participants to add to our interviews by emailing me any additional information that they considered valuable.

2. “Rich” Data

As with the above, rich data comes from a longer term involvement, which was not possible. Obtaining rich data is also possible, by asking not only how something is done, but also what was done and why. The latter I incorporated in my interviews.

3. Respondent validation

I returned the transcribed interviews to the participants and received feedback which I added into my data set.

4. Intervention

During interviews certain teachers were more forth-coming with information than others, so I gently probed until I received responses, although I was careful not to tell them what to say.

5. Searching for Discrepant Evidence and Negative Cases

I report on all responses, even discrepant ones, and discuss them in my findings.

6. Triangulation

Collecting information via interviews, and emails, and artefacts showing use, has allowed for some triangulation, or viewing the data from different angles, in a fairly limited manner.

7. Quasi-Statistics

There were a few obvious descriptive statistics obtained from the data, which I have included in my findings.

8. Comparison

I have made comparisons between how the various teachers use the EM&ES open textbooks, and related their different contexts, in my findings.

Maxwell's (2005:115) final recommendation when dealing with validity is to consider generalization. He suggests that internal generalization is essential. I have included all my participants' responses and not just those that I felt would look good in the research conclusions. Maxwell maintains that external generalization is not necessary in a qualitative study and it could rather "provide an account of a setting ... illuminating ... an "ideal type"" (2005:115).

I obtained permission from the school principals (Appendix C) and from all the teachers interviewed (Appendix D) and in the case of School A, a government school, permission from the Western Cape Education Department (Appendix A and B). I also followed the guidelines of the University of Cape Town ethics committee with regards to interviewing people. The interviews were transcribed and made available for review by interviewees. While I am not a teacher and not part of Siyavula, I have made every effort to describe the pedagogical use of the EM&ES open textbooks fairly. I am, however, slightly prejudiced as I believe that the EM&ES open textbooks are exemplary OER, and OER in general has potential to aid educators. Anonymity is not possible, as I know the participants from the interviews, but I guaranteed them confidentiality.

3.9 Research procedure

Finding times to interview very busy teachers was a challenge. And the time taken to interview teachers was spread over a few months. Table 3.2 shows some key milestones.

Table 3.2: Key milestones

July to Aug 2011	Proposal
September to November 2011	Introduction and Literature Review
March and April 2012	Prepared questions and requested permissions
8 th May 2012	Pilot interview
22 nd May 2012	Interview 1, with Roger at School A
4 th June 2012	Interview 2, with School C teachers

27 th July 2012	Interview 3, with School B teachers
31 st August 2012	Interview 4, with Amien at School A
16 th September 2012	All transcripts completed
31 st October 2012	Coding and analysis completed
29 th January 2013	Dissertation handed in

3.10 Chapter summary

This chapter covered the research orientation, which is interpretive; in order to understand how and why teachers use the EM&ES open textbooks and to what extent a community of practice has formed around the teachers' use of EM&ES open textbooks. The type of research is qualitative, as this is the most appropriate type of research for this study as it focuses on specific scenarios. The methodology is a single, key, exploratory case study, using snapshot data collection, by conducting standardized open-ended, face-to-face interviews with a snowball sample of teachers using the EM&ES open textbooks. Data transcribed from interviews was collated and coded in logical categories and themes, using *Excel* as a tool. And finally, Maxwell's (2005) guidance for valid qualitative research was followed as closely as possible to ensure that this research is credible.

University of Cape Town

4 Findings and Discussion

4.1 Introduction

This chapter uses the lens of a Community of Practice (CoP) (Wenger, 2006) in an endeavour to analyse and interpret the utterances of teachers interviewed. The question that I will attempt to answer is: *How and why do teachers use the Everything Maths and Everything Science open textbooks and to what extent has a community of practice formed around the use of the EM&ES open textbooks?*

4.2 Contextualising the findings

Details of teachers and schools were gathered from the interviews conducted and are shown in Table 4.1. The ages given are my own observations.

Table 4.1 Teacher and school details

Teacher			Open textbook	School
Changed Name	Age	Activities and experience		
Roger	40-50	A science teacher, who also teaches maths. He has excellent ICT skills, teaches almost entirely electronically and actively uses other OER. (Roger, Int1, lines 13-14, 33, 101, 161, 312-313, 359)	Everything Science and Everything Maths	School A: A sub-urban Public school, with internet access and inter-active whiteboards available and access to computers for the learners. 70% of pupils also have internet access at home. (Roger, Int1, line 360) and (Amien, Int4, lines 11, 15-17)
Amien	40-50	An experienced science teacher using the ICT equipment available to him. (Amien, Int4, lines 3, 11, 135)	Everything Science	
Andrew	20-30	An inexperienced science teacher who also teaches maths. He mainly uses a stand alone laptop and does connect to the internet for research. (Andrew, Int3, lines 21, 214-215)	Everything Science and Everything Maths	School B: A small poor private school with a very diverse learner population. Internet access is intermittent and there is no ICT support for teachers. Learners do however have access to computers. (Roger, Int1, lines 17, 22-28, 36, 80, 264-265)
Lindiwe	30-40	An experienced maths teacher in need of ICT support. (Lindiwe, Int3, lines 42-46, 58-59, 124-125)	Everything Maths	
Ann	40-50	An experienced maths teacher using the ICTs available. (Ann, Int2, lines 38, 116-120)	Everything Maths	School C: A well-resourced private school, where a choice was made to use ebooks and learners use macbooks and ipads. They have an IT director and trainers to support the teachers. They have internet access at school and almost all learners have access to the internet at home. (Ann, Int2, line 38), (Renier, Int2, line 4), (Ingrid, Int2, lines 15, 17-18, 20), and (Evelyn, Int2, line 130)
Ingrid	40-50	An experienced maths teacher using the ICTs available. (Ingrid, Int2, line 15) and (Ann, Int2, lines 116-120)	Everything Maths	
Harold	30-40	An experienced science teacher using the ICTs available. (Harold, Int2, line 112)	Everything Science	
Evelyn	30-40	An experienced science teacher using the ICTs available. (Evelyn, Int2, lines 130, 413-414)	Everything Science	
Renier	50-60	An experienced maths teacher using the ICTs available. Head of Maths department. (Renier, Int2, lines 169-170)	Everything Maths	

I use the order of the most frequently occurring themes of utterances, within the CoP framework, to order the write-up of my findings. The Domain, or area of interest, had the most utterances (120), followed by Practice (84), then Community (73) (Figure 4.1).

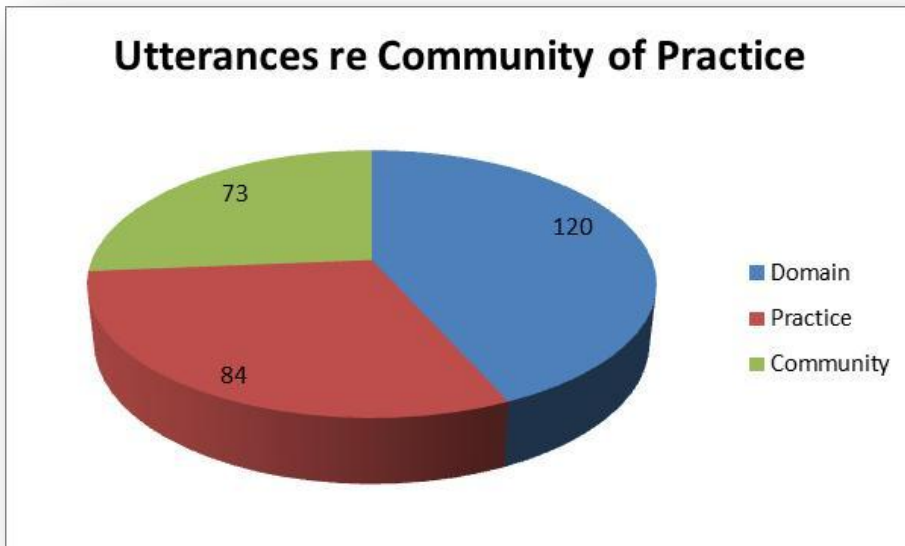


Figure 4.1: The number of utterances per sphere of Community of Practice

The depiction of CoP categories combined with aspects of openness (Table 4.2) highlights the number of utterances per group.

Table 4.2 CoP categories with aspects of openness

Community of Practice	Financial	Technology	Social	Legal	Pedagogy	Grand Total
Domain	17	34	8	1	60	120
Practice	5	3			76	84
Community	9	10	39		15	73
Grand Total	31	47	47	1	151	277

Table 4.3 shows the CoP categories, aspects of OER categories and thereafter categories and sub categories of the utterances that emerged during interviews and while coding the data, and reflects the order of presentation in this chapter.

Table 4.3 Order of write-up by categorised utterances:

Utterances categorised - Order of Write-up			
Community of Practice	OER aspect	Categories	Sub Category
Domain (120)	Pedagogy (60)	good quality content (31)	
		not enough Q&A and practise exercises (12)	
		optimal levels of content (6)	
		teaching issue - Not OER (4)	
		no teacher's guide (3)	
		feedback ensures quality (3)	
		annotate (1)	
	Technology (34)	interactive features (12)	
		use enabled (9)	
		surfeit information (4)	
		on-going upgrades (4)	
		restrictions (2)	
		print ready formats (1)	
		selection (1)	
Financial (17)	enabling innovation (1)		
	cost reduction (13)		
Social (8)	sustainability (4)		
	knowledge sharing (7)		
Legal (1)	individual interest (1)		
	open licences (1)		
Practice (84)	Pedagogy (76)	Use as-is (47)	hardcopy (18)
			online (15)
			digital (12)
			interactive features (1)
	combine (11)	mobile (1)	
		supplement (9)	
	adapt (10)	digitally (2)	
		not adapted (6)	
		no need - content good (2)	
		not able to adapt (1)	
	share (8)	vision (1)	
vision (4)			
not shared (3)			
via Siyavula (1)			
Financial (5)	optimal printing methods (5)		
Technology (3)	internet not always available (3)		
Community (73)	Social (39)	Social learning (39)	support from Siyavula (10)
			support colleagues (9)
			support from school (8)
			support from colleagues (4)
			support external colleagues (3)
			training required (3)
			support from DOE (1)
	time required (1)		
	Pedagogy (15)	self-study (13)	
		enabling revision (2)	
Technology (10)	enabling knowledge sharing (7)		
	restrictions (3)		
Financial (9)	cost benefit (9)		

4.3 Domain: The area of interest

The Domain is the area of interest in the CoP as described by Wenger (2006) and, in this study, includes the Everything Maths and Everything Science (EM&ES) open textbooks, Maths and Science teaching in general, technology, and Open Educational Resources (OER).

The Domain lens is used to scrutinise the utterances made by the teachers interviewed in order to gain insight into the questions:

- Why do teachers use the EM&ES open textbooks?
- What are the teachers learning?

By asking questions related to these research questions, I hope to establish the extent to which teachers have a shared interest in the domain and shared competence, and in doing so relate the findings to Wenger’s description of a domain, where he says a community of practice has “an identity defined by a shared domain of interest. Membership therefore implies a commitment to the domain, and therefore a shared competence that distinguishes members from other people.” (2006:1). The utterances are further categorised by the aspects of OER as explained by Hodgkinson-Williams and Gray (2008), namely, financial, technology, social, legal and pedagogy.

As the interviewees were all maths or science teachers, it is not surprising that most of the utterances in the domain, are about that aspect of OER that deals with teaching and learning, namely pedagogy (60), then technology (34), financial (17), social (8) and legal (1) (Figure 4.2).

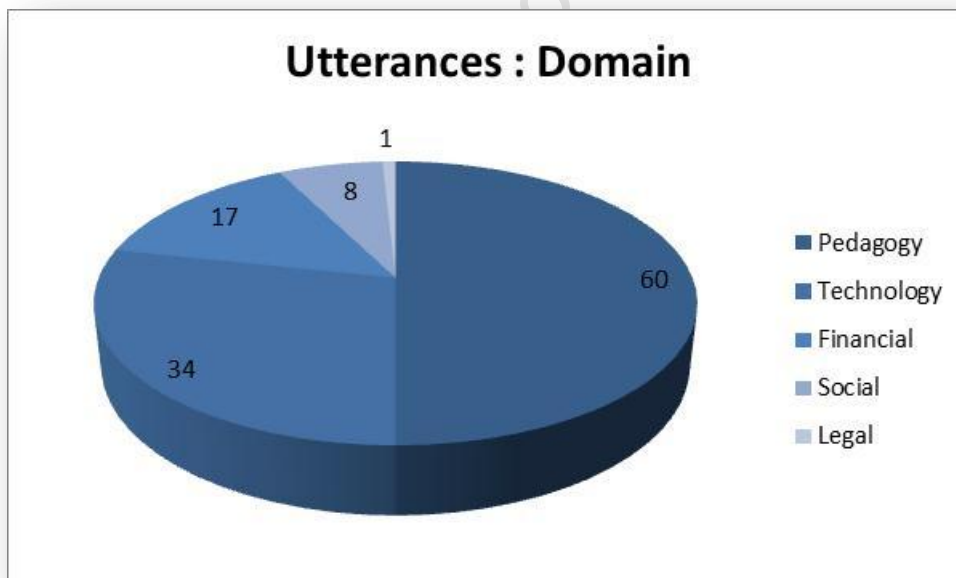


Figure 4.2: Summary of utterances as categorised into aspects of OER as part of the Domain

4.3.1 Why teachers use EM&ES: Pedagogical reasons and concerns

Compelling pedagogical reasons that teachers had for using the EM&ES open textbooks mainly had to do with good quality content (31) followed by other pedagogical concerns and

observations like not enough questions and answers and practice exercises (12), optimal levels of content (6), teaching issues (4), no teacher's guide (3), feedback ensuring quality (3) and annotation (1) (Figure 4.3).

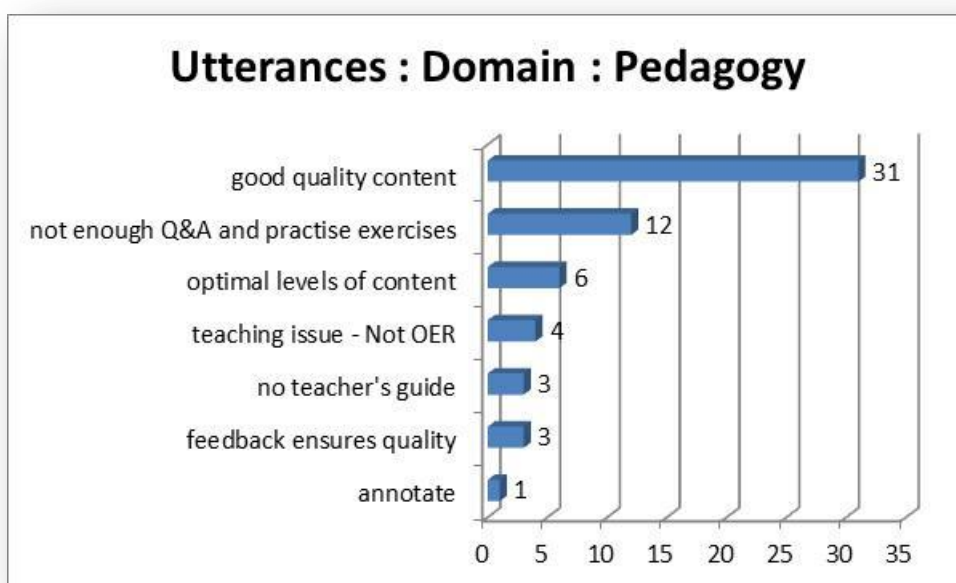


Figure 4.3: Summary of utterances as categorised under Domain: Pedagogy

Teachers were very positive about the **good quality content** of the EM&ES open textbooks, and expressed the opinion that concepts are well explained, content is comprehensive, well-structured and written in accessible language. Keeping the learners in mind, teachers felt that the books are “*discovery oriented*” (Roger,Int1,Page:2,line:79), “*systematic*” (Amien,Int4,Page:4,line:133 -134) and the learners “*knew what they had learnt, [as the book] has got nice summaries*” (Roger,Int1,Page:3,line:92-94). Two examples mention the comprehensiveness and ease-of-use of the books:

- “*I’ve yet to see a textbook that lays out the work for science and maths as clearly and instinctively as these textbooks do*” (Roger,Int1,Page:3,line:115-117)
- “*It’s a very good book in terms of easy reading. ... I feel at ease if I take my weakest learners and say just read that book and see if you can understand that chapter, and they will be able to*” (Amien,Int4,Page:3,line:118-120)

Teachers also find that the books teach them: “*... how to choose the best way of explaining things*” (Andrew,Int3,Page:6,line:213-216), “*... how to make the content authentic to everyday life*” (Lindiwe,Int3,Page:6,line:217-222), and how to teach “*concepts that were a challenge to teach*” (Amien,Int4,Page:4,line:130-133). And finally, the books were “*something that I know I can trust and that I can use*” (Roger,Int1,Page:2,line:72-73).

While the reasons for using the EM&ES open textbooks were numerous, a few key concerns were mentioned, the main ones being **insufficient questions and answers, and practice exercises**. Teachers felt that there was a need for a greater “*variety of questions and answers*” (Harold,Int2,Page:3,line:108-110). Teachers also wanted numerous and varied practice exercises but felt this was not the case. Lindiwe (Int3,Page:2,line:59-67) said that “*Maths is a practical subject, with lots and lots and lots of practice, for the children, that’s*

where, for me, the book is lacking”, and Reinier (Int2,Page:7,line:259-267) felt that “... you have to have more problems, ... in terms of how questions are asked in papers, you’ve got your certain percentage knowledge, then you’ve got routine, and complex and then you’ve got your problem solving. You need more in every category... I don’t think the book always has enough of that.”

With regards to **optimal levels of content**, teachers are concerned that the scope of the content is sometimes too wide, and includes “a lot of content in the book that is not examinable” (Ingrid,Int2,Page:2,line:76-81), or unevenly covered, as explained by Harold (Int2,Page:9,line:354-369): “content, that’s not there, but should be there, or it’s a bit thin, or in some sections of the book, content is very thick for example, and you don’t really need to go into that much detail”.

Pertaining to all, **not only open, textbooks**, teachers explained that changing textbooks was difficult because “as a teacher ... there’s lots and lots of things you have to manage everyday” (Ann,Int2,Page:10,line:377-380) and going “from a textbook ... that worked very well ... we decided to change and use an electronic textbook” (Harold,Int2,Page:7 and 8,line:283-289) and “the amount of effort to digest a [new] textbook is huge” (Roger,Int1,Page:11,line:486-492).

While teachers were concerned that there was **no teacher’s guide** for all the EM&ES open textbooks (Lindiwe,Int3,Page:2,line:40-42), being able to provide **feedback** to the book’s creators has definite advantages and the teachers are appreciative of this; saying that the Annotate feature, allowing feedback, will increase the quality and “errors should be able to be corrected more rapidly than with a hardcopy” (Ingrid,Int2,Page:8,line:331-337). There is also an opinion that **annotating** in a textbook is desirable (Roger,Int1,Page:4,line:149-150).

The good quality content of the EM&ES open textbooks is mentioned frequently, and while the optimal levels of practice exercises and questions were lesser concerns, they suggested that the potential for good quality content rests with teachers’ feedback.

4.3.2 Why teachers use EM&ES: Technological reasons and concerns

Utterances categorised into technological reasons for using the EM&ES open textbooks are mainly the interactive features (12) and that technology enables use (9) of OERs (Figure 4.4), but also mentioned are a surfeit of information (4), on-going upgrades (4), restrictions (2), selection (1), print ready formats (1) and enabling innovation (1).

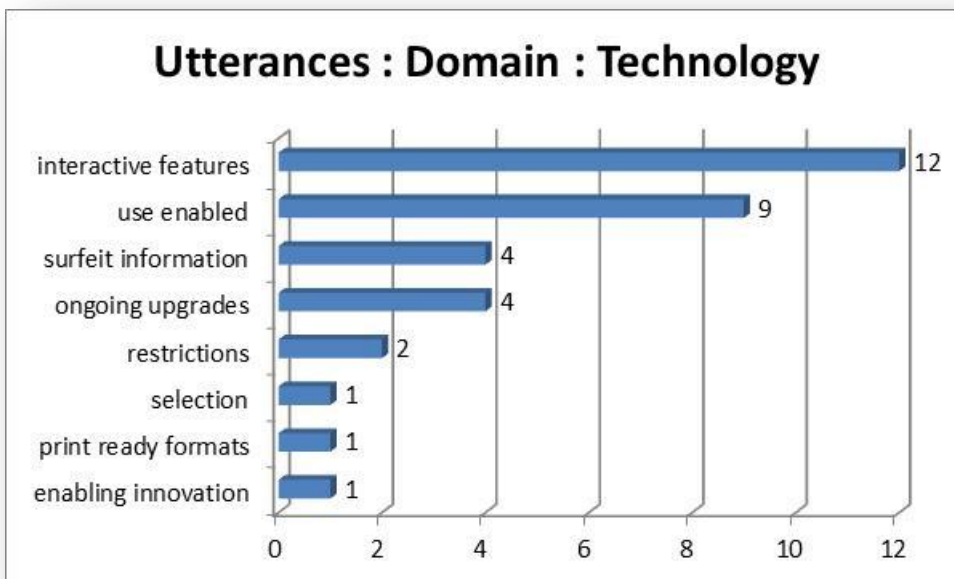


Figure 4.4 Summary of utterances as categorised under Domain: Technology

When used online, the books have embedded **interactive features** which allow the teachers to use the “*media enriched content*” (Ingrid,Int2,Page:8,line:330-331) to “*enhance the lesson*” (Ingrid,Int2,Page:3,line:102-104). The embedded online simulations capture the learners attention: “*I have the grade 10 textbooks ... we learn about atoms ... and isotopes ... so you do a simulation when you add so many protons and so many neutrons and so on ... and because I was teaching ... the same topic to the grade 8s, I used that simulation in the grade 10 textbook and used it on the grade 8s ... they wanted some more, and some more ... for them it was engaging*” (Evelyn,Int2,Page:10,line:413-419). There is also enthusiastic anticipation of the possibilities afforded by technology: “*I can just imagine, you do a practical, you’ve got an iPad ... you click onto your book, click onto your video clip and you can actually see the practical*” (Amien,Int4,Page:2,line:60-64). Interactive videos and simulations are really helpful, and apart from the fact that the most appropriate pre-selected interactive features make “*life easier ... I don’t have to look for it myself*” (Andrew,Int3,Page:3,line:100-107), they also assist in preparing lessons: “*the fact that you can logon ... click on something and there’s the video. If you’re a teacher with an interactive board, prepping is [easy].*” (Amien,Int4,Page:2,line:53-55).

Technology is the **enabler that allows the use** of the open textbooks. One school made the strategic choice to go “*the digital way*” (Reinier,Int2,Page:4,line:140) with a “*one-to-one laptop program in the school*” (Ingrid,Int2,Page:3,line:99-102). Carrying around heavy books will be a thing of the past as learners “*don’t have to carry around books all the time*” (Reinier,Int2,Page:4,line:147-148). There are also many other new resources available and it’s up to the teachers to use them: “[the] *answer series that we used as a standard thing in the past, now the DOE [Department of Education], and IEB [Independent Examination Board], has all those papers [on their websites] ... with the memos as well ... basically a compilation of past exam papers. But those are all now available to learners online ... and so it’s another shift ... it’s another book we don’t really need to buy because it’s ... online and we*

can use ...” (Ingrid,Int2,Page:8,line:299-306). Lindiwe, however, is concerned about internet availability: “I don’t know how many kids will be able to get access to the internet to make full use of the books” (Int3,Page:5,line:170-174).

While the following categories only had between one and four utterances each, they were pertinent insights.

- The **surfeit of information** on the internet can be daunting and as Roger explains: “Science is awash with material on the web. You could spend 8 hours a day, 5 days a week, just finding science material on the web” (Int1,Page:2,line:70-72). It is also most helpful to have had someone else find applicable videos to use (Ingrid,Int2,Page:3,line:104-106).
- Even though **on-going upgrades** of the EM&ES online texts can be disruptive, teachers are appreciative of the effect of changes: “... things change, and improve ... originally you weren’t able to click on a chapter and go straight there, you had a very long scroll down section ... that improved ...” (Ingrid,Int2,Page:2,line:72-76). Another teacher made a suggestion for an advanced maths open textbook, in the series, as he can envisage the potential of such a resource (Reinier,Int2,Page:11,line:435-442).
- Depending on how technology is used there are some **restrictions**; for instance, if the school only wants to use the interactive online books for all the learners then some of those learners are disadvantaged as “they don’t [all] have laptops. I can only project it to them, they can’t go forwards and backwards” (Ingrid,Int2,Page:3,line:87-90).
- **Print ready formats** offer flexibility as the books could be printed in different sizes to suit different departments, for example: “the maths guys preferred to have them printed A4, they liked them big, they didn’t like them small, whereas my science kids were happy with the smaller text. They could hand out section by section, and the kids could file it. And that works for that teacher, filing was better” (Roger,Int1,Page:7,line:290-295).
- **Selecting** material from the internet is particularly difficult and part of the learning curve for teachers: “to select is quite hard ... you have to be very selective ... I think that’s the main thing I’ve learnt” (Reinier,Int2,Page:10,line:396-397).
- And finally, technology **enables innovative teaching techniques**, such as flipping the class: “... one of our ladies that trains us in IT ... what she’s taught us is, what they call flipping the class ... you let the kids go and watch the videos at home, and then you use the class time to practise problem solving, and exercises and that ... and this allows you to do that. So I can say to them ok so this is where we are in the book now ... because I actually follow the textbook as it goes, according to the CAPS [Curriculum Aligned Policy Statement] ... and then I say: for tomorrow’s lesson you need to go and watch this video, and then we’re going to discuss it and work through and so on ...” (Evelyn,Int2,Page:4,line:130-139).

Technology’s interactive features and general enabling of OER use makes it possible to use the EM&ES open textbooks and their embedded videos and simulations in various ways and it allows teachers to explore new ways of teaching and learning.

4.3.3 Why teachers use EM&ES: Financial reasons and concerns

Financial reasons for using the EM&ES open textbooks had to do with cost reduction (13) and sustainability (4) (Figure 4.5).

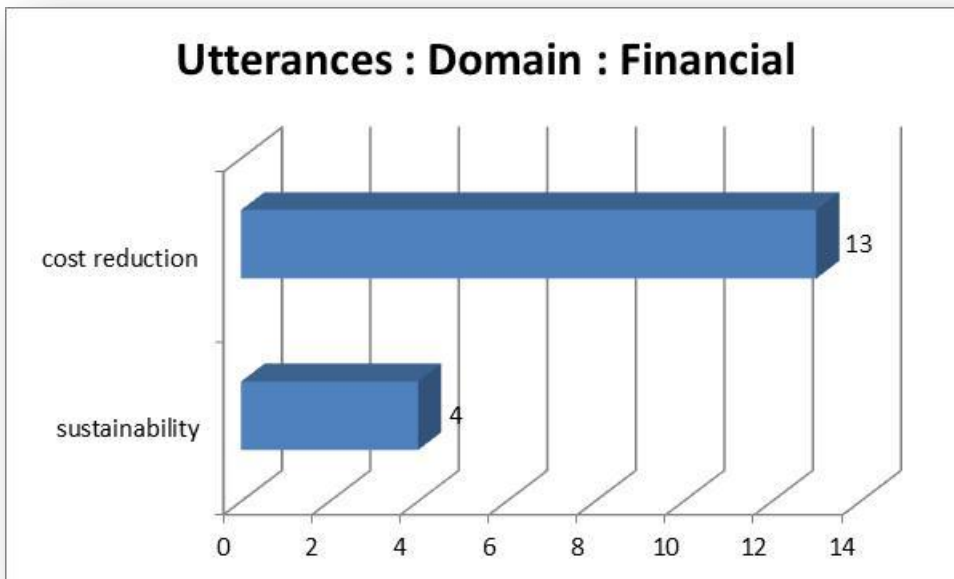


Figure 4.5 Summary of utterances as categorised under Domain: Financial

A key reason for using the EM&ES open textbooks is **cost reduction**. There is no cost involved when using the online version, or a minimal cost when printing, as Roger (Int1,Page:3,line:123-129) indicated, saying that independent schools could make deals with *“the local printing shop, [who printed the books] at R40 a copy. And put a cover on ...”*, while at government schools *“... they delivered 2 trolleys full of textbooks, [which] are free”* (Roger,Int1,Page:5,line:203). **Sustainability** is also a concern for teachers as they need to know that the creation, upgrading and availability of the EM&ES open textbooks will be on-going (Roger,Int1,Page:11,line:478-482).

The high cost of textbooks is one of the first reasons why open textbooks are considered, and once they are being used it is imperative for teachers to know that the resource is sustainable and available in future.

4.3.4 Why teachers use EM&ES: Social and legal reasons and concerns

Social reasons for using EM&ES open textbooks include **sharing knowledge** or wanting to share knowledge: *“ ... when I go to the resource called FullMarks, I’ve been using that a lot to draw up ... test questions ... and exercise questions ... we’re all saying there’s not enough questions ... and when I go to their questions I see the same woman’s name, or the same guy’s name ... and I think, ... the next thing for me would be to contribute”* (Evelyn,Int2,Page:7,line:273-280). Improving one’s own knowledge, or **individual interest**, is another compelling reason to use OER: *“One of the things I still want to learn, is where there’s a lack ... maybe they’ve already got a way of teaching something through a video or simulation ... what do I need to learn to put together ... a game or a simulation ... that sort of thing, that isn’t there yet ... to put it there myself. I don’t want to re-invent the wheel either”* (Evelyn,Int2,Page:10,line:388-395).

Legal implications of copyright issues concerned one teacher, and while she was aware of the **open licences** under which EM&ES were registered, she wanted to legally use various other resources: “... *there’s always copyright issues and how safe it is to add it to your own textbook, whereas with this, I don’t have that concern ... And that puts my mind at ease. But I would like to move towards being able to fetch something else, elsewhere and put it into my textbook and use it again the next time. I want to be able to see how freely I can do that ... I would like to learn*” (Evelyn,Int2,Page:11,line:443-450). Subsequent to this, Evelyn sent me an email to say she had attended a Siyavula meeting and received much more clarity on open licencing.

Sharing knowledge and improving one’s teaching are social reasons for using open textbooks but teachers need to be aware of legal issues such as copyright and open licences.

4.3.5 Domain findings and discussion

Pedagogical reasons for using the EM&ES open textbooks were evident in the positive comments from teachers who said that the concepts are well explained, the content is comprehensive, and the books are well-structured, written in accessible language, and are easy to use. Teachers also found that the EM&ES open textbooks helped them by simplifying complex concepts and giving examples that are applicable to daily life, and they are a succinct, trusted resource. The teachers’ confirmation that learning is happening when these books are used satisfies the condition made by Lane (2008) who said that learning ultimately needs to take place when an OER is used. Teachers did however feel that the books had insufficient, and not sufficiently varied, questions and answers, and practice exercises. These concerns can be off-set by the use of the new low-cost premium *Intelligence Practice* service¹⁶, or greater participation in building up the *Fullmarks* assessment bank¹⁷, or using the old exam papers now available online from the department of education (Ingrid,Int2,Page:8,line:299-306). They found changing from one textbook to another time consuming and needed teacher’s guides to all the EM&ES open textbooks. Teachers’ Guides are, currently, only available for the Grade 10 open textbooks¹⁸. Two teachers found that content was not always optimally distributed, but teachers acknowledge the value of the Annotate feature in providing feedback to create an even better product. Giving input to the updating of open textbooks is an essential feature of open textbooks according to Frydenberg and Matkin (2007). One teacher wishes that it was always possible for learners to annotate their textbooks. Research confirms that making notes in textbooks is an effective learning strategy (Wiley et al., 2012).

Technology enables the use of pre-selected, embedded videos and simulations, which enhance the lesson, capture learners’ attention and make lesson preparation easier. Petrides et al. (2011) found that the students are particularly interested in interactive features of the open textbooks. Some teachers interviewed showed enthusiasm for harnessing future possibilities of technology, such as tablets. While technology, especially the internet and Web 2.0 technologies (Brown, 2008; Hodgkinson-Williams and Gray, 2008; Davis et al.,

¹⁶ <http://projects.siyavula.com/technology-driven-learning/>

¹⁷ <http://projects.siyavula.com/technology-powered-teaching/>

¹⁸ <http://everythingscience.co.za/schoolorders>

2010) enables the use of the open textbooks, the use of the EM&ES open textbooks, and other OER, both require a paradigm shift from previous teaching methods. Technological challenges include: Internet access is not guaranteed for all learners and needs to be worked around, wading through the surfeit of information on the web requires skilled selection, and schools, teachers and learners working with different levels of technology need to be accommodated. Technology also allows for on-going upgrades of the open textbooks, print ready formats – which provide flexibility – and makes innovative teaching techniques possible. Sapire and Reed (2011) found that making OER available digitally, in formats ready for printing, reached the largest audience, as internet availability is not guaranteed in all areas.

Financial implications of the cost reduction provided by the EM&ES open textbooks are appreciated. The books are free online and can be printed at low cost. Apart from the obvious cost savings of using open textbooks, mentioned by many researchers (Prabhala and Caine, c2004; Petrides et al., 2011; Allen, 2010:14; Sapire, 2010; Wiley et al., 2012), Tuomi suggests that open resources can “increase in value when they are used” and that not using them “may carry social costs” (2006:4). There is awareness among the teachers interviewed of the need for sustainability in keeping up-to-date with technology, alignment to changing curriculum and on-going upgrading of the EM&ES open textbooks.

Social learning or knowledge sharing and individual growth, are reasons to use the EM&ES open textbooks as teachers assist each other and develop their own skills while doing so. This ties in to Petrides et al. (2011) who mention that the possibility of knowledge sharing exists when using open textbooks, while Sapire and Reed (2011) found that OER were more likely to be used and adapted where lecturers could use their own pedagogic approaches to design their own courses. The latter applied to those teachers interviewed who were able to take the initiative to start using the EM&ES open textbooks. Participation in the creation (Wolfenden, 2008) and creation for a specific audience (Sapire, 2010) are other social reasons for using OER. Feedback to Siyavula allows for participation in the creation, but more so the update, of the EM&ES open textbooks which were written to cover the curriculum used by the teachers interviewed. Finally, Isaack (2011) suggests that developing countries can gain by using OER, and, as mentioned by one teacher (Amien,Int4,Page:2,line:58-60), even if the learners only receive the EM&ES hard copies, they will benefit.

One teacher interviewed indicated the need to be versed in open licensing to make full use of opportunities provided by the use of the EM&ES open textbooks. Frydenberg and Matkin indicate that OER has to be “Made very Available” (2007:4), and this important dimension is enabled by open licences.

When reviewing to what extent the teachers interviewed have a “shared domain of interest” and “shared competence” (Wenger, 2006), I found that, while OER and technology are part of the domain or area of shared interest, the main shared interest of the teachers interviewed is the teaching of Maths and Science. Using free, open textbooks that can help the teachers make their daily tasks easier, becomes a shared interest. They also share a competence as Maths and Science teachers, made clear by their evaluation of the EM&ES open textbooks in terms of content, structure, concept explanation and language accessibility. The domain of shared interest and shared competence is therefore clear, and in this study, includes the

EM&ES open textbooks, Maths and Science teaching, and to a lesser extent, technology and OER generally.

The reasons listed as to why the teachers are using the EM&ES open textbooks show the noticeable extent to which teachers have a shared domain of interest and a shared competence, and the teachers can therefore legitimately belong to this CoP, even if they are peripheral participators (Lave and Wenger, 1991).

4.4 Practice: The activities

The Practice consists of the activities involved in the CoP which, in this case, includes how the EM&ES open textbooks are accessed and used.

The Practice lens, for analysing the utterances made by teachers interviewed, looks for answers to the questions:

- How do the teachers access the EM&ES open textbooks?
- How do the teachers reuse (use as-is) the EM&ES open textbooks (copy, print, etc.)?
- How do the teachers revise (adapt) the EM&ES open textbooks to make them suitable to their context?
- How do teachers remix (combine) the EM&ES open textbooks with any other materials?
- How do teachers redistribute (share) their revised or remixed materials to others?

By asking questions related to these research questions, I intend to establish the extent to which teachers are practitioners and have developed a shared repertoire and resources, and in doing so relate the findings to Wenger's description of a practice, where he says: "Members of a CoP are practitioners. They develop a shared repertoire of resources: experiences, stories, tools, ways of addressing recurring problems—in short a shared practice" (2006:2). The questions around reuse, revise, remix and redistribute refer to Wiley's (2009) 4Rs of OER use.

Pedagogy (76) is again uppermost on the teacher's minds as the teacher's discuss Practice (Figure 4.6), followed by Finance (5) and Technology (3).

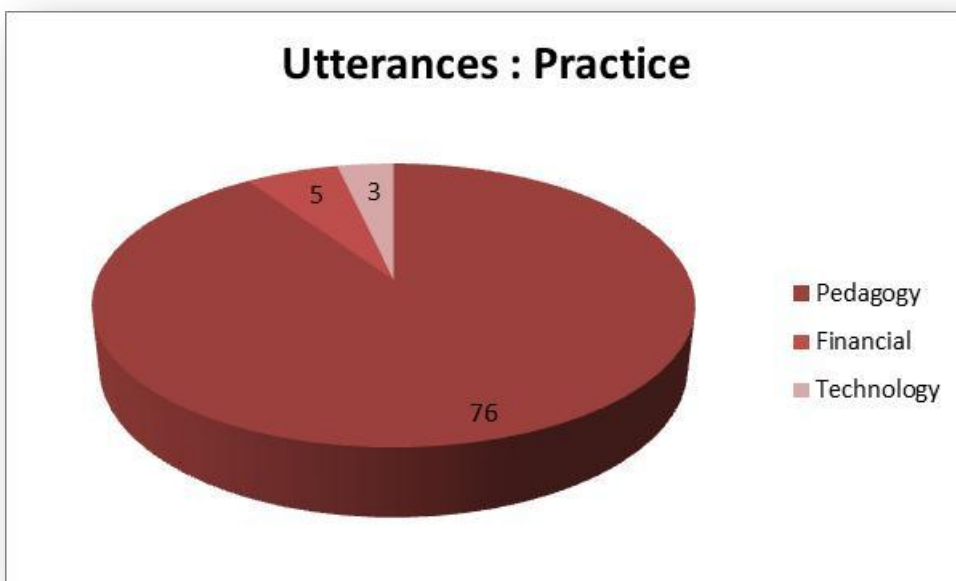


Figure 4.6: Summary of utterances as categorised into aspects of OER as part of the Practice

4.4.1 How teachers use EM&ES: Pedagogical activities and issues

The utterances related to “use as-is” or reuse (47) are the most prevalent, then combine or remix (11), adapt or revise (10) and finally share or redistribute (8) (Figure 4.7).

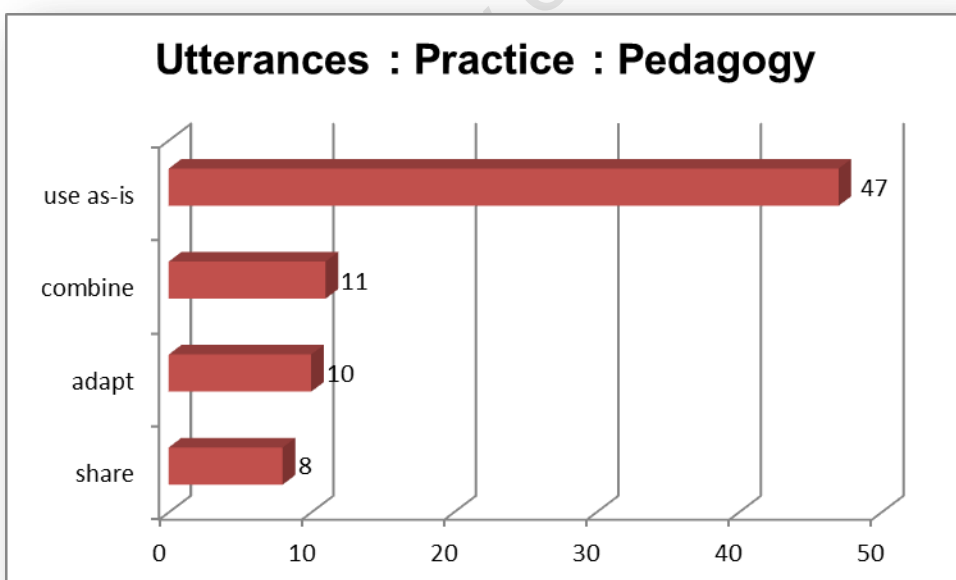


Figure 4.7: Summary of utterances as categorised under Practice: Pedagogy

The content of the curriculum aligned EM&ES open textbooks is mainly **used as-is**, but there are various formats in which the books can be used. Most of the utterances around “use as-is” pertain to the printed copy (18) of the EM&ES open textbooks, followed by those

related to using the books online (15), digitally (12), and finally mobile (1) and interactive features (1) (Figure 4.8). *Online* refers to using internet connectivity to access the resource, while *digitally* refers to a downloaded, electronic copy of the resources on, for example, a stand-alone computer.

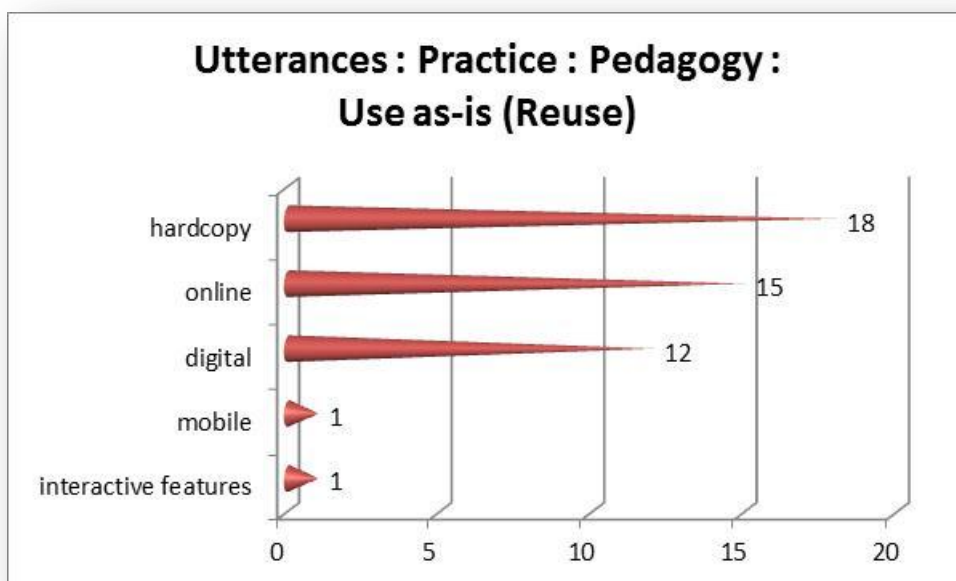


Figure 4.8: Summary of utterances as categorised under Practice: Pedagogy: Use as-is (Reuse)

The use of **hardcopies** refers to those printed by the school or local printers, printed by Siyavula, and those printed by the Department of Basic Education. Having the school print their own copies was advantageous in that learners could “*keep the textbook.*” (Roger,Int1,Page:3,line:131). At another school, learners were given the option of ordering copies from Siyavula, or just have the online or digital copy, and “*and possibly about half of the learners did, and half didn’t.*” (Ingrid,Int2,Page:1,line:21-22). Different classes also decided differently and in one class the learners opted mainly for hard copies, “*I think it’s like a safety security blanket kind of scenario, where they want the hard copy*” (Evelyn,Int2,Page:2,line:40-43). At the school where the books were printed by the department of education they are available as “*a supplementary resource*” (Roger,Int1,Page:4,line:155-160) for those who lost out on learning and teaching before, as the books arrived some time after the start of the school year.

Ingrid was one of the teachers who indicated that she uses the books **online**, directly from “*the internet*” (Int2,Page:1,line:15) and she projects “*the content to the screen and we work from that*” (Ingrid,Int2,Page:1,line:19-20). Another teacher, while using the book differently to teach says: “*if I do need solutions to the problem, because I don’t know what the answer is, I go to everythingmaths.co.za and I look it up there*” (Andrew,Int3,Page:1,line:22-26). While the benefit of accessing it online, is, “*as a class tool, perfect, [and] for those who have computers at home it is a perfect tool, [there is still an access issue as] we’re still sitting with a ratio of about ... 30% of the kids don’t have that access to the internet*” (Amien,Int4,Page:1,line:14-17).

Digital or electronic copies of books make them easier to use as they are “*very much more teacher friendly*” (Roger,Int1,Page:7,line:320-322). Teachers do not, or cannot, rely on permanent access to the internet and they copy a pdf version of the books to their personal computers, and use it from there. “*I have a copy of the books on my desktop*” (Ann,Int2,Page:1,line:37) and even those learners using only the online versions, have an electronic backup: “*Even with the internet down, most of them have downloaded it. So you may not have the interactive online version for that moment, but they still have a copy*” (Ingrid,Int2,Page:2,line:69-71).

Interactive boards lend themselves to the use of the **interactive features** of these books: “*I use the interactive board ... I use my highlighter and highlight certain issues, I don’t have to print. It saves one actually on printing ...*” (Amien,Int4,Page:2 and 3,line:82-86) and with regards to **mobile** use; learners are known to “*access it on their phones,*” (Evelyn,Int2,Page:2,line:54,) but exact numbers weren’t provided.

When asked about **combining** the EM&ES open textbook content with anything else, the most common utterance had to do with supplementing (9) the books with other text books or vice versa, and some digital (2) combinations (Figure 4.9).

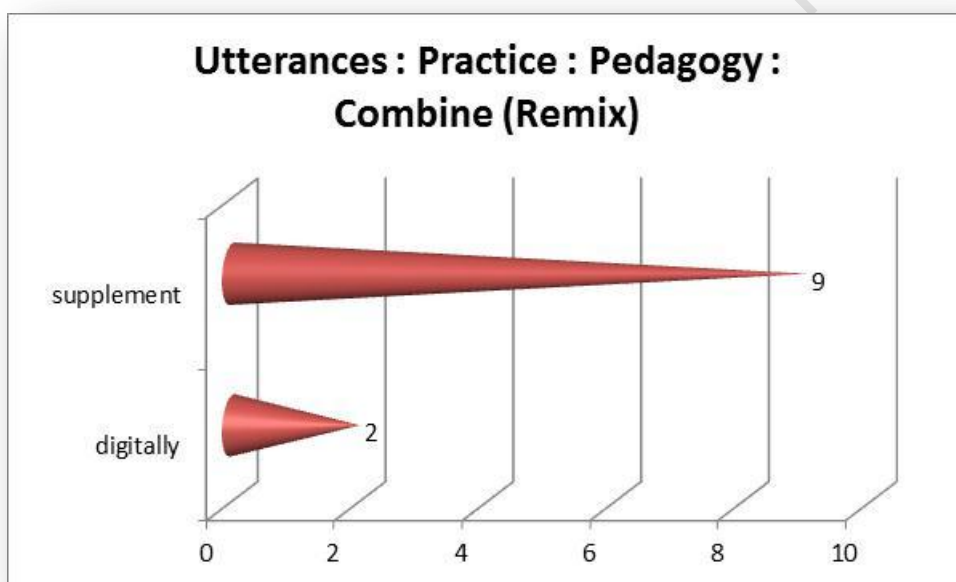


Figure 4.9: Summary of utterances as categorised under Practice: Pedagogy: Combine (Remix)

While Roger combines the EM&ES open textbooks with other resources **digitally**, as shown in Figures 4.11 and 4.12, other teachers combine the books with printed resources, using EM&ES either as the primary or as the secondary resource and **supplementing** their lessons as explained by Ingrid (Int2,Page:4,line:153-155); “*In matric, although it is our primary textbook, we do have a small practise book, with practise examples, that is a small A5 hardcopy so that has helped in terms of the supplementing*”.

Utterances show that the EM&ES open textbooks are mostly not adapted (6), or there was no need to adapt as the content was good (2), had a vision to adapt (1) or were not able to adapt (1) (Figure 4.10).

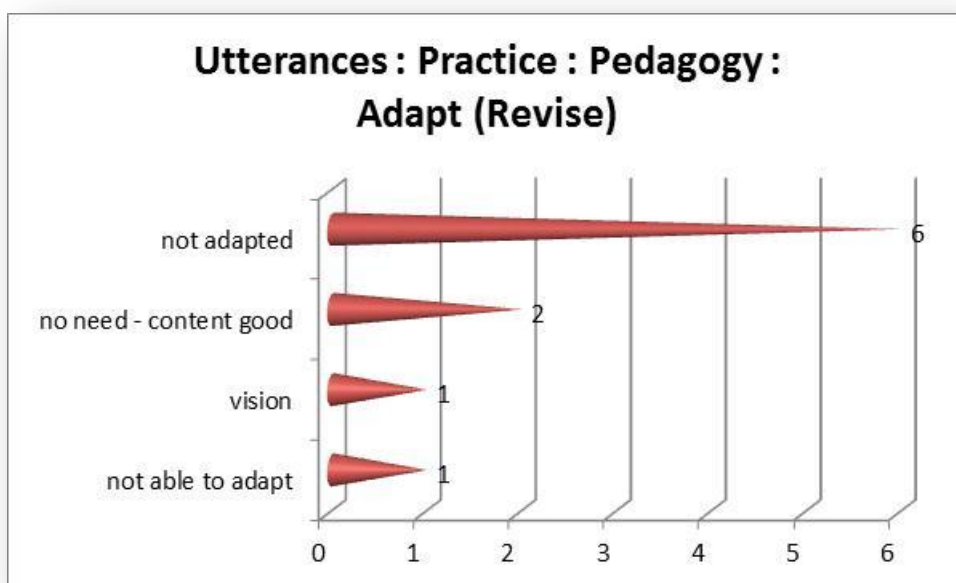


Figure 4.10: Summary of utterances as categorised under Practice: Pedagogy: Adapt (Revise)

Three or four teachers thought about **adapting**, and one would like to do so in future, but none of those interviewed has done so, mostly because they “*don’t ... see the need*” (Andrew,Int3,Page:5,line:183-184). Others felt the content was good and “*I don’t need to adapt it for the learners ... it’s very accessible*” (Roger,Int1,Page:8,line:333-334). However Roger (Int1,Page:8,line:334-348) did look at the open textbooks on the Connexions repository and felt he was not able to edit the open textbooks from there as “*they may as well have published it encrypted ... [as it was not] editable by me*”.

Since the teachers interviewed did not adapt the EM&ES open textbooks, they do not have adapted versions to **share**. All they share is the fact that the OER are available and that they use these open textbooks. Roger (Int1,Page:9,line:404-411) has a vision of sharing with his colleagues, where he analyses the book and selects appropriate sections, and adds others. He then downloads that copy, and prints that version for the learners, and uses the same copy on the screen as they have printed, so that the pages and exercises can have the same number on the screen as in the book. And once he is ready, he doesn’t want it changed again for a year. Roger (Int1,Page:9,line:389-391) shared his use of *FreeMind*, open source mind-mapping software, and *Zoom-it*, open source software that enables one to use a laptop and projector as an interactive whiteboard, with the Siyavula team. He explained how he used *FreeMind* to create his lesson plans and link to various resources from there. In Figure 4.11 one can see a portion of his mindmap with the link to the PhysicalScience_Gr11_2011.pdf (Everything Science Gr11 .pdf downloaded).

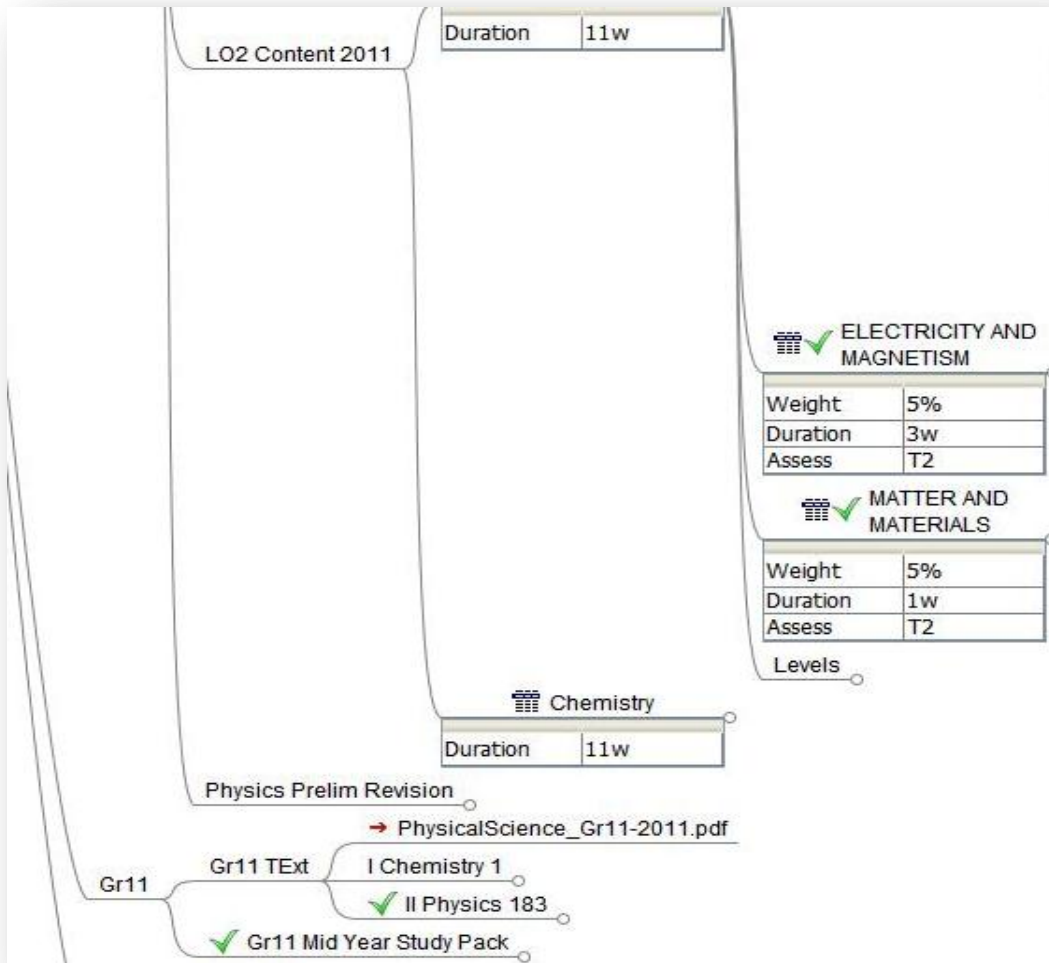


Figure 4.11: *Freemind* excerpt showing link to Everything Science Grade 11

Figure 4.12 shows another area of the same mindmap with links to a wave simulation and other resources.

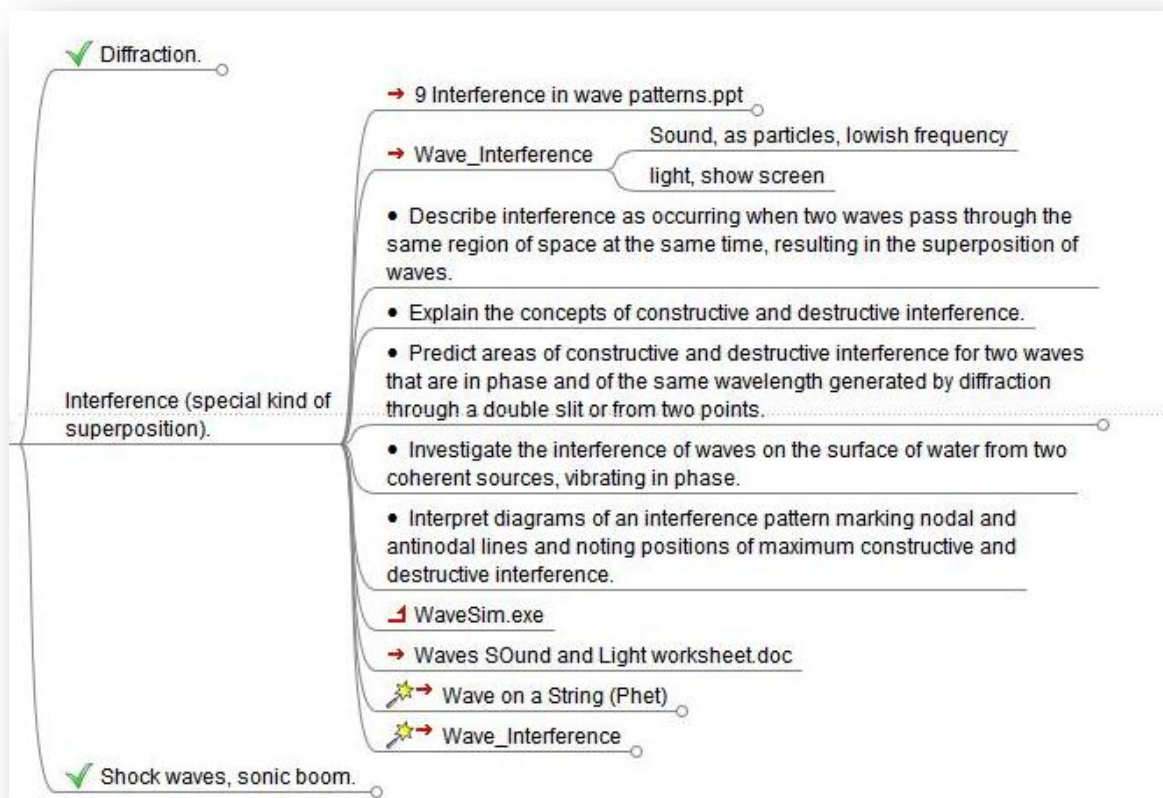


Figure 4.12: *Freemind* excerpt, showing links to various resources

Pedagogical use of the EM&ES open textbooks is mainly: “use as-is”, in various formats. Depending on the situation at the different schools, the EM&ES open textbooks were either printed by local printers, which allowed them freedom of choice regarding customised covers and size, or the school ordered copies from the Siyavula website, or, at government schools, the education department printed and delivered the books. While some teachers use the interactive online version of the book on a daily basis, others use the everythingmaths.co.za website to find answers to certain questions. Teachers use a pdf or electronic version of the books, either as the only method of use, or as a backup, copied to their personal computers; and some learners also used their mobile phones to access the books. One teacher explained that he used the interactive features in the EM&ES open textbooks using an interactive whiteboard. The content of the EM&ES open textbooks was used, in combination, as supplements to, or supplements for, other books. The open textbooks are not adapted because: there is no need, the content is good, teachers were unable to adapt or teachers would still like to. Sharing adapted content did not happen as a result of no-one adapting. However, one teacher shared his electronic combination of the open textbooks and other resources with myself and Siyavula.

4.4.2 How teachers use EM&ES: Financial and technological activities and issues

Financial issues in the practice arena deal with practicalities. Even though the book might be open and only the **printing** paid for; if the book is not well bound, then this can influence how teachers and students use the it. Andrew, whose printing was done by a local printer,

says “I don’t use my hard copy anymore ... just because the printing is a bit dodgy ... it breaks in two down the side ...” (Int3,Page:1,line:19-21), while Amien, whose school received copies printed by the Education Department, has this concern: “I’m still worried about the fact that the book fell apart, because if we hand out those books, those books must come back ...” (Int4,Page:2,line:50-52).

Technology has limitations in practice as **internet availability** is still a problem in some areas, where “the internet just doesn’t exist [or] it’s not fast enough” (Roger,Int1,Page:9,line:379-380) and not everyone has access at home either as indicated by Lindiwe who says: “So if you come across a difficult exercise and you want to check ... [the] answers ... You have to logon to the internet ... when I’m working from home ... I find it difficult” (Int3,Page:2,line:40-46).

Printing methods have financial implications and a badly bound book can change the perceptions of a book. Technological limitations that need consideration for how the EM&ES open textbooks are used include the fact that the internet is not always available to all.

4.4.3 Practice findings and discussion

Teachers mainly use the EM&ES open textbooks as-is, while the various methods of printing, online or digital use, provides the flexibility required. Teachers do not adapt these open textbooks as yet, but do combine or supplement them with other resources, or vice versa. The fact that “use as-is” or reuse is the predominant method of use of the EM&ES open textbooks is similar to the findings of Hilton III et al. (2012) in their studies. This is especially applicable when OER are created for a specific audience (Wolfenden, 2008; Sapire, 2010), which is also the case with the EM&ES open textbooks. Sapire (2010) suggests that using course materials, as-is, could result in the biggest time and cost saving, a finding which is confirmed by Wiley et al. (2012). The EM&ES open textbooks are not adapted, shared or combined in the OER definition of these, described by Wiley’s 4Rs (Hilton III et al, 2010) although this remains a possibility for the future. While not yet applicable to this scenario, Wolfenden et al. indicated that the people involved in adaptation process were enthusiastic about “educational innovation and innovative pedagogies” (2012:12). The intention was also to show how the use fitted in with Wiley’s 4Rs of OER use (Hilton III et al, 2010), namely: Reuse (Use as-is); Revise (Adapt); Remix (Combine); Redistribute (Share). I found the 4Rs difficult words to use with the teachers, as the 4Rs might relate easily to general OER use, but do not seem to fit as well with the subset of OER which is open textbooks, so I used the words “Use as-is”, Adapt, Combine and Share.

While internet availability for all learners is not a reality yet, it is necessary to be aware that inexpensive print binding can have negative effects on the use of the open textbooks. Wiley et al. (2012) have researched the most cost-effective printing scenarios, but quality binding is imperative.

How teachers are using the EM&ES open textbooks, points to the fact that they are being used, but also shows that there are still many ways in which teachers could be making full use of these open textbooks. While the teachers have their profession in common, they could also be creating a shared repertoire and resources around the use of the EM&ES

open textbooks, or an Open Educational Practice (OEP) as described by Ehlers and Conole (2010) where the OEP includes the shared processes around the use of the OER.

When reviewing to what extent the interviewed teachers are practitioners and to what extent they have developed a shared repertoire and resources (Wenger, 2006:2), I found that teachers are practitioners by the nature of their profession and are starting to share methods of using the EM&ES open textbooks. The EM&ES open textbooks can be used without outside help but some teachers require assistance with the technological aspects. Strategies for adapting, combining and sharing also require thought.

4.5 Community: Members

The Community consists of the parties involved in the CoP, which includes Teachers, Learners, Schools, the Siyavula team, and Education Authorities.

The Community lens, for analysing the utterances made by teachers interviewed, looks for answers to the questions:

- Who constitutes the community?
- How do they assist each other?

By asking the questions related to these research questions I hoped to establish the extent to which teachers assist and learn from each other by sharing information; and in so doing relate the findings to Wenger's description of the community, where he says "members engage in joint activities and discussions, help each other, and share information. They build relationships that enable them to learn from each other" (2006:2).

Most of the utterances about community concern social aspects (39), followed by pedagogy (15), technology (10) and financial issues (9) (Figure 4.13).

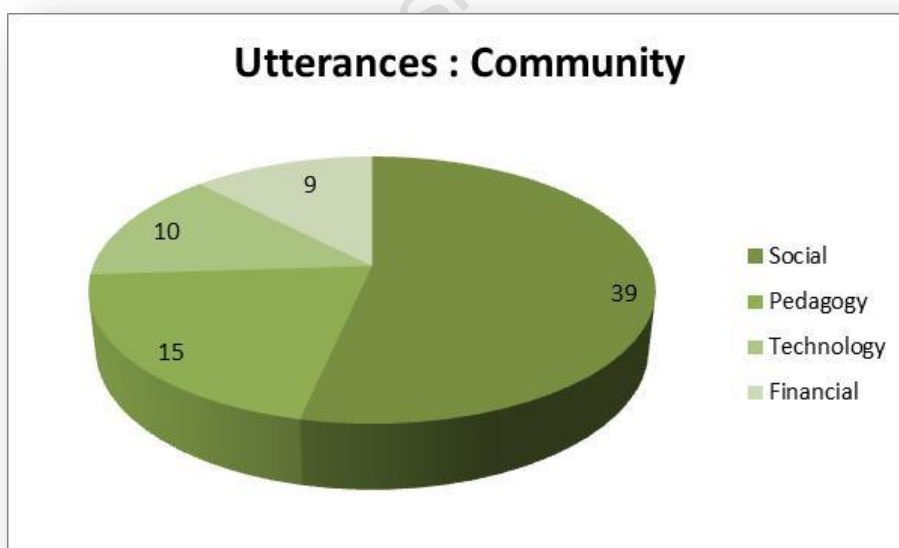


Figure 4.13 Summary of utterances as categorised as part of the Community

4.5.1 Community: Teacher's views on social aspects

Social aspects dominate the utterances around community and all pertain to **social learning** (Brown, 2008) with the people assisting each other or being assisted, with support from Siyavula (10), supporting colleagues (9) and support from school (8) being the most prominent. Also featured are support from colleagues (4), training required (3), supporting external colleagues (3), time required (1) and support from the DOE (1) (Figure 4.14).

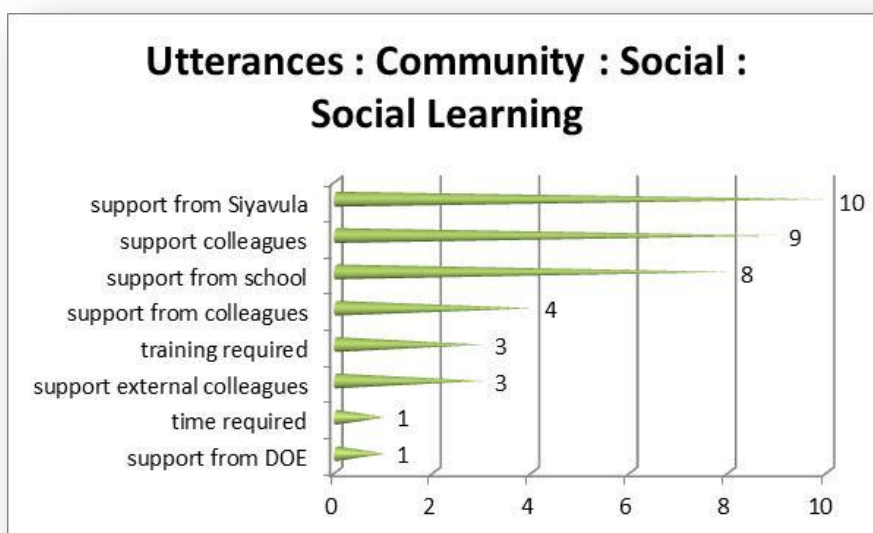


Figure 4.14 Summary of utterances as categorised as part of the Community: Social: Social learning

Support from Siyavula is obtained when teachers meet the Siyavula team at teachers' conferences or at the Siyavula offices, where they can ask questions and learn about what is available to them. They also appreciated the fact that having someone else searching the internet for resources was invaluable: "so to have had other people who have already trawled and found the best ... it's a huge help" (Ingrid,Int2,Page:3,line:106-107). Teachers who interacted with Mark Horner and the Siyavula team found them very supportive. "Mark Horner has also been to our school ... and he has come to assist us ... and we are on the Siyavula mailing list, so if they have workshops, they let us know ... and we're welcome to attend and ask questions if we want to" (Evelyn,Int2,Page:5,line:174-177).

Assisting or **supporting colleagues** was the norm at the school where the strategic direction was to use electronic books. While "the e-book itself is ... straight-forward" (Reinier,Int2,Page:5,line:168-173) teachers help each other in various ways, one of which is by showing "how his students high-light things" (Evelyn,Int2,Page:5,line:179-181) and another by "discussing among ourselves" (Ingrid,Int2,Page:5,line:190-191). Guidance and **support from the school** is critical and some schools are fortunate to have "an IT department ... they assist us if they can ... so if there is something I need to know I can go to them" (Evelyn,Int2,Page:5,line:177-179). Teachers appreciated **support from colleagues** especially when using technology (Amien,Int4,Page:2,line:65-68), but also in initiating the use of the EM&ES open textbooks (Lindiwe,Int3,Page:1,line:11-14). Teachers do however

require training and feel that this new way of doing things needs getting used to and “*it would be nice to have more training in terms of tips and skills ... [and] one needs practise and exposure to methods of using the books more effectively*” (Ingrid,Int2,Page:3,line:90-94). Getting more familiar with technical aspects, like “*more training in terms of ... highlighting and editing of the text*” (Ingrid,Int2,Page:5,line:191-195).

Supporting external colleagues when they meet them also spreads the word about the EM&ES open textbooks to teachers at other schools. We “*... attended a CAPS conference ... and we said to ... other teachers from schools that didn’t have textbooks that they should use them*” (Ann,Int2,Page:5,line:182-186). Another voiced that she has “*teacher friends who were unaware of this resource and I’ve certainly mentioned it ...*” (Ingrid,Int2,Page:5,line:188-190). **Time** for teachers is a very scarce commodity and while they would like to contribute and learn new things, there needs to be a change in mind-set to allow them to do just that: “*Just this realisation ... if we’re going to be working as a community ... that requires time where one can collaborate, and in a school ... the reality is that we can’t meet as a department ... never mind collaboration between subjects, never mind the bigger community issue ... so ... there has to ... be a buy in, into the importance of this, in terms of making time for it ...*” (Ingrid,Int2,Page:11,line:458-464). The **Department of Education** provided **support** by printing copies for all government schools (Roger,Int1,Page:11,line:501-506).

Social learning (Brown, 2008) seems to be the catalyst that will firmly entrench the use of these open textbooks and other OER, as long as all stakeholders are prepared to learn, and assist each other and ask for assistance, when needed.

4.5.2 Community: Teacher’s views on pedagogical aspects

Utterances around pedagogy in the community revealed that the EM&ES open textbooks are geared towards self-study (13) and enabled revision (2) (Figure 4.15).

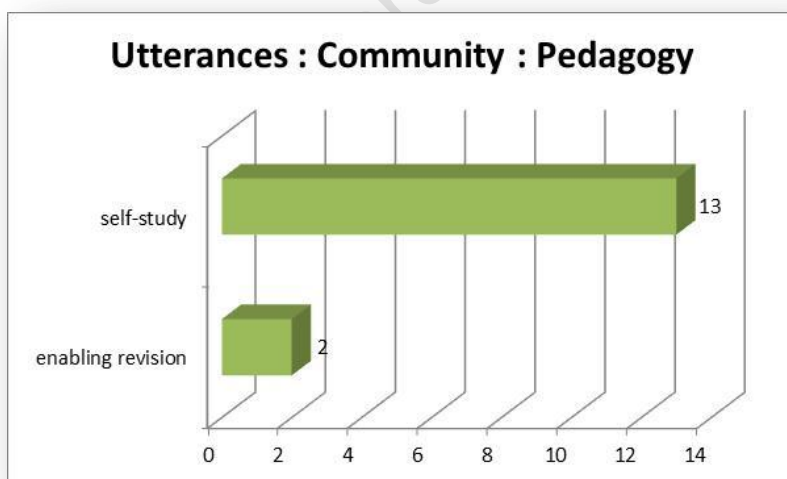


Figure 4.15 Summary of utterances as categorised as part of the Community: Pedagogy

There were some insightful comments from teachers, who had observed learners relate to the EM&ES open textbooks. Teachers indicated that **independent study** was now possible

for the learners. They also mention that learners find the books easy to understand as shown in these three examples:

- “... self-learning ... I see that ... particularly with stronger learners in my matric group ... because suddenly they have access to the textbooks ... my matrics often use cellphones ... because they don't have the laptops, but the better learners, will sit there and something will be bothering them, something we're looking at doesn't quite make sense, the next minute they've got their cellphones out and they're doing their own thing ... whereas in class before they would've been frustrated ... it would've been a dead-end. So ... but that's the top-end learners I find are engaging in that way ...” (Ingrid,Int2,Page:11,line:420-428).
- “... It's quite nice that they can have access to any grade textbook. Like I got a strong group of Grade 11s, they could go onto a grade 12 topic and dip into it. It's a nice thing for them to do” (Ann,Int2,Page:11,line:430-432).
- “... I handed out the book on a Friday ... the Monday ... “Wow sir, it's easy to read”, “the first time I've been able to understand it” ... it reaches out to those who have difficulty in understanding ... and also accommodates those who are sets higher than your average ...” (Amien,Int4,Page:1,line:28-36).

Teachers also feel that they can learn from the books and it “is so important that teachers can learn, because some of the stuff is hard” (Roger,Int1,Page:10,line:453-455). Learners at government schools around South Africa were given a printed copy of the EM&ES open textbooks by the Department of Basic Education and teachers saw this as a positive move: “I think it is great. It did a couple of things. One: It was a stamp of approval. Two: For dysfunctional schools ... they have a resource to study from without a teacher ...” (Roger,Int1,Page:6,line:270-276).

Revision is enabled by having an electronic copy of a book which is available for grades 10, 11 and 12. Roger (Int1,Page:3,line:101-109) revises a topic for his grade 12 class, using the earlier grades' books.

The teachers indicated that the EM&ES open textbooks enable independent study and revision.

4.5.3 Community: Teacher's views on technological and financial aspects

Technology is the catalyst that **enables knowledge sharing** and teachers are starting to embrace the digital world by assisting their learners and placing “a lot of old papers on the intranet, and also the solutions are there” (Reinier,Int2,Page:4,line:157-161). However **restrictions** do occur. How a school decides to use technology can have an impact; and if a school has decided to go exclusively online, then learners are hindered as you sometimes “have people who have their internet giving problems at home” (Reinier,Int2,Page:2,line:59-60).

Financially, use of the EM&ES open textbooks present schools, parents, teachers and learners with a **cost benefit**. Teachers help the learners by getting an electronic version of the book for them if they've lost their textbook (Roger,Int1,Page:6,line:259-262) and at the school that chose to use the EM&ES open textbooks for economic reasons, the books are their primary textbooks (Roger,Int1,Page:1,line:34).

Technology enables knowledge sharing and while not all access to technology is equal, and alternate ways of using technology might need to be harnessed, the cost benefit to all stakeholders using open textbooks cannot be ignored.

4.5.4 Community findings and discussion

Using the EM and ES open textbooks is challenging for some teachers and social learning is potentially helpful to them. The Siyavula team are where answers can be found to anything related to the use of the open textbooks, and they have proved to be very supportive to anyone who has approached them. The teachers support their colleagues, most frequently with the use of technology. Schools can make strategic choices as to how the books are used, for example, as primary or secondary textbooks, as digital or hardcopy books, and this in turn influences how teachers use the books. Schools can influence the adoption of OER by offering appropriate support. Teachers also need assistance from colleagues, or training, around using the books optimally, especially on the best ways to use the available technologies. Teachers are occasionally able to assist external colleagues, and are generally keen to be more involved, but tend to be hamstrung by time constraints. Support from the DOE in printing the EM&ES open textbooks is valued. Brown and Adler (2008) suggest that learning to participate and collaborate are some of the advantages of belonging to communities of practice.

Pedagogically: Learners using the EM&ES open textbooks are now able to study independently, looking ahead to future grades, or revising previous grades' work; they do this by using their mobile phones, or online facilities or the hardcopy books, because they find the content accessible. Teachers also find themselves learning from the books. Sapire and Reed (2011) and Wolfenden (2008) also found that OER afforded lecturers the opportunity for independent study. Not mentioned by the teachers interviewed in this study, but research by Wiley et al. (2012) found the academic results of students who used the open textbooks were equal to, or better, than those using conventional textbooks.

Technology enables knowledge sharing and the use of the EM&ES open textbooks has resulted in the use of other OER, which teachers are sharing to a limited extent. Like Petrides et al. (2011) this study found that the potential for knowledge sharing exists in using open textbooks. The availability of the internet, laptops, web-enabled mobile phones, and the continual availability of the study material (Hilton III and Laman, 2012) allows the using of technology as a strategy. This study revealed that different schools have different levels of technology available to them, but they could strategize accordingly. Financially there is a cost benefit to schools, teachers, parents, and learners using the EM&ES open textbooks and Yuen and Li (2012) confirm this by suggesting that educators, parents and learners could benefit financially if they were free to use open textbooks.

When exploring to what extent teachers assist and learn from each other by sharing information (Wenger, 2006:2), I found that the teachers interviewed assisted each other and also asked for assistance when this was necessary. The strategic decisions made by the education department and schools influence how the EM&ES books are being used. The Siyavula team assists teachers and schools by being supportive and sharing information. The potential for greater participation and involvement is substantial and the teachers that

were involved with getting the most out of the EM&ES open textbooks were also the teachers that were the most enthusiastic about the books.

4.6 Overall views

Ignoring the community of practice categories for a moment and reviewing the grouping of utterances from a different angle, that of the aspects of openness, namely, financial, technology, legal, social and pedagogy, the following picture emerges (Figure 4.16): Pedagogical issues are the most significant to teachers (151), followed by technology (47) and social (47), and then financial (31) and legal (1).

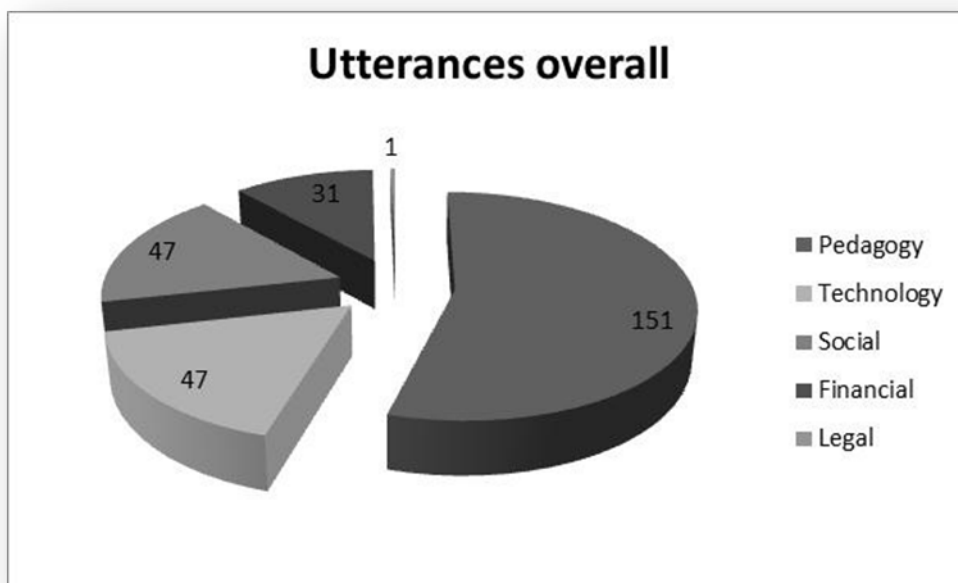


Figure 4.16 Utterances: Aspects of openness

So while financial reasons for using OER are often the first cited, pedagogical reasons for using the EM&ES open textbooks carry the most weight.

Another general view is to assess where the CoP surrounding the use of the EM&ES open textbooks resides in Kim et al.'s (2012) quadrant defining CoPs. While many of the teachers interviewed can be categorised as receiving knowledge, others, and the Siyavula team, are propagating and sharing knowledge. So while the CoP surrounding the use of the EM&ES open textbooks has plenty of potential to grow it can already be classified as an Active Community according to Kim et al. (2012) and is represented in Figure 4.17 which is an adaptation of the diagram of Types of CoP (Kim et al., 2012:13098) also shown in Figure 2.10 (Chapter 2).

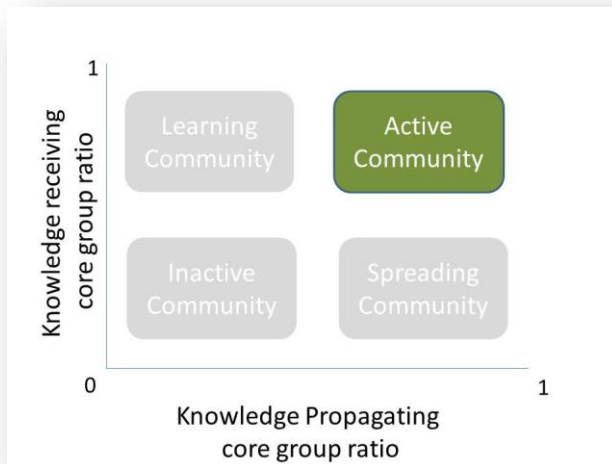


Figure 4.17: Use of EM&ES is surrounded by an Active CoP (adapted from Types of CoP (Kim et al., 2012:13098))

4.7 Chapter summary

The CoP theory was a useful lens through which to explore the use of the EM&ES open textbooks. The Domain, Practice and Community spheres answering the “why use?”, “how used?” and “who assists?” questions respectively.

- Why teachers used the open textbooks pointed to the well-written, solid content of the books, as well as their OER features of being free, online and available in various digital formats.
- How the books are used, indicates that there are many ways to use open textbooks, from printed versions to interactive mobile versions.
- Who used the books, was evidenced as both teachers and learners found them usable.

The CoP theory lens also provides the opportunity to see to what extent a CoP has formed around the teachers interviewed. The focus on Domain, Practice and Community can also answer “the area of interest?”, “the shared practice?” and “the assisting of each other?” questions respectively.

- Teachers share a competence and interest in the area of Maths and Science teaching, as is evidenced by their evaluation of the EM&ES open textbooks in terms of content, structure, concept explanation and language accessibility. The use of the open textbooks in particular, and OER and technology in general, are the areas of shared interest in this study. Apart from the fact that the EM&ES open textbooks are aligned to the South African Maths and Science curriculum for Grades 10, 11 and 12, they are also well-structured with comprehensive content and clearly explained concepts. The books are easy to use as the language is understandable. Other reasons for using the books are the OER reasons of free availability, digital availability and applicable embedded online links to videos and simulations. The Annotate feature allowing feedback to the creators enables input from teachers. Teachers will use a good, trusted resource if it enhances their ability to teach Maths and Science. Skills to select appropriate OER material are being learnt in parallel to using the EM&ES open textbooks.

- Teachers obviously share the practice of teaching Maths and Science, but the focus of this study is the use of the EM&ES open textbooks; and while the books themselves are easy to use, even as self-study material, the sharing of methods of use, especially around technology, is only starting. Sharing innovative teaching practices around the books is probably easier than adapting, combining and sharing altered versions of the EM&ES open textbooks, which are only visionary thoughts at this stage. The content of the EM&ES open textbooks is not changed by teachers and the books are “used as-is”. They are however used in various formats, from printed copies, digital copies to interactive online use and via mobile phones.
- Assisting others is a natural activity for teachers and where they can, they do; but they also require assistance, especially around technology issues. The Siyavula team have made information and support available, but schools and educational authorities would need to prioritise technological training and knowledge sharing. Technology is the one area where teachers assist each other and need to be assisted. Strategic directions given by schools and education authorities, around how the open textbooks are used, needs to be under-pinned by appropriate support. This is especially pertinent around the time and skills needed to embrace new ways of working with technology. Independent study and thus revision is possible for learners with the EM&ES open textbooks. The Siyavula team has support available via their websites.

While there is not a formal named CoP around the use of EM&ES open textbooks, the Siyavula team has created a core and it is possible for all South African (and other) Maths and Science teachers to be involved in using these open textbooks, and using the embedded videos and simulations and, most importantly, providing feedback via the Annotate feature and the everythingmaths.co.za, everythingscience.co.za or Siyavula websites directly.

Teachers are natural legitimate peripheral participators (Lave and Wenger, 1991) in such a CoP, as this is their field of expertise, and the use of the EM&ES open textbooks could benefit them and their learners, even if they do not formally belong to a CoP. I would define the CoP around the use of the EM&ES open textbooks an Active Community, using Kim et al.’s (2012) definition of Types of CoP (Figure 2.10), as the CoP can be described as knowledge sharing, with some groups receiving knowledge and other groups propagating knowledge, or both. So while the larger CoP is forming around Siyavula and the creation, distribution and use of these open textbooks, teachers could benefit even further by creating their own CoPs, with like-minded teachers, or teachers from a geographical area, online or at school, along with some technological expertise, and learn how to make the most of teaching and learning using technology and OER, given the start they have with the Everything Maths and Everything Science open textbooks.

5 Summary and recommendations

The final chapter of the dissertation contains a summary of findings, limitations of the study, a conclusion and recommendations for further actions and research.

5.1 Summary of Findings

In an endeavour to establish why and how teachers are using the Everything Maths and Everything Science (EM&ES) open textbooks, and to what extent a Community of Practice (CoP) has formed around the use of these books, the study pinpointed the following findings that can be clustered in three groups. The first group focuses on using the teachers' practices through the CoP lens, the second group assesses the extent to which a CoP has formed around the teachers' use of the EM&ES open textbooks and the third group shows the type of CoP (following Kim 2012 et al.'s classification) that has emerged around the use of the EM&ES open textbooks.

The first group of findings is listed according to order of the most utterances within the CoP lens, namely Domain or why the books are used, then Practice or how the books are used, and then Community or who uses and assists others in the use of the EM&ES open textbooks. Within each of the CoP categories the findings are grouped according to the various aspects of OER, namely financial, technological, social, legal and pedagogical.

- *Domain*: Teachers use the EM&ES open textbooks because, **pedagogically**, they are well-written and have good quality content. A concern expressed by teachers was the optimal levels of practice exercises and content, but a feedback system to rectify any issues is available. The use of OER and the EM&ES open textbooks is enabled by **technology** which also allows the EM&ES open textbooks to be online, be accessible, have interactive features and be available in various digital formats. Technology also allows for the possibility of exploring new ways of teaching and learning. **Financial** reasons for using the EM&ES open textbooks are that they are free, or available at a low print-only cost, as opposed to the high cost of conventional textbooks. **Social** reasons of knowledge sharing and self-improvement are considerations for using open textbooks, new technology or methods, and **legally** open licencing enables use of the EM&ES open textbooks.
- *Practice*: **Pedagogically**, how the EM&ES open text books are used is viewed via Wiley's (2009) 4R framework, i.e. reuse, revise, remix and redistribute. The open textbooks are mainly used as-is (reused) and not adapted (revised). The EM&ES open textbooks are not combined (remixed) in the conventional sense of OER remixing, but are supplemented by other resources or deployed as supplements to other resources. It was high-lighted that **financial** decisions can compromise quality and badly bound printed copies affect how people perceive and use the open textbooks. **Technologically**, the books are used in various ways, from printed versions to interactive mobile versions, but technological limitations sometimes need working around.
- *Community*: **Socially**, the community surrounding the use of the EM&ES open textbooks, namely, teachers, the Siyavula team, schools and technologists assist each other, or need to, in order to use OER and the EM&ES open textbooks effectively, and this ultimately promotes social learning. **Pedagogically**, self-study and revision are enabled by the EM&ES open textbooks. While **technology** enables knowledge sharing,

there is still a problem that not all teachers or learners have internet access. **Financially**, schools, parents, and learners, are the beneficiaries of this open resource.

Reviewing the use of the EM&ES open textbooks through a community of practice lens revealed the extent to which a CoP has formed around the use of the EM&ES open textbooks.

- *Domain*: The extent to which the teachers have shared competence and interest in the area of Maths and Science teaching, is evidenced by their evaluation of the EM&ES open textbooks in terms of content, structure, concept explanation and language accessibility. The use of the EM&ES open textbooks, OER and using technology in teaching are also shared interests, although competence in this area is developing and varied.
- *Practice*: Teachers share the practice of teaching Maths and Science, and now the use of the EM&ES open textbooks. Sharing the way in which teachers use these open textbooks, other OER and technology in teaching, is only in its infancy and this is the area where a meaningful difference can be made, as not all teachers are equally confident in the use of technology and thus in the use of the online, interactive features, of the books. Different schools have different levels of technology available, but documenting methods to overcome technology deficiencies could be of great help to teachers. A shared repertoire of practices would strengthen this leg of a CoP.
- *Community*: While assisting others is a natural activity for teachers, and the Siyavula team have made information and support available, schools and educational authorities will need to prioritise technological training and knowledge sharing, to further strengthen the community area of the CoP.

Finally, a CoP is forming around the creation, distribution and use of the EM&ES open textbooks, with the Siyavula team as the core, and this CoP can be classified as an Active Community (Kim et al. 2012).

5.2 Limitations of study

The printing of the EM&ES open textbooks by the Department of Education, and the making available of the EM&ES open textbooks on mobile phones and *MXit*, during 2011, have enabled many more people to be aware of, and to use these open textbooks. This study included only nine teachers, and while they had very useful comments to make, a much wider study could be conducted.

Teacher availability dictated that the interviews were conducted as group or individual interviews. This probably resulted in some views mimicking others in the group situation, or not considering certain issues in the individual situation, and thereby potentially influencing the findings. Also, certain points which were only made once, but might be very relevant to the use of OER, would not have been made prominent in the findings. The data collected could also have been analysed in many different ways, allowing for different findings to be highlighted. Classroom observation of the use of the EM&ES open textbooks would also have strengthened the research in this dissertation, but this was deliberately excluded given the limited scope of this minor dissertation.

The CoP lens was a useful lens for viewing the data collected, but ascertaining the extent to which a CoP has formed around the teachers using the EM&ES open textbooks, only touched the surface, as it needed wider investigation and more data than was obtained for this research.

5.3 Conclusion

The Everything Maths and Everything Science open textbooks are mainly used as-is and not adapted. While it is natural to think that financial reasons are the main reason for using the EM&ES open textbooks, and they are significant; pedagogical issues, namely scope and good quality of content are of more importance to the teachers, as is the availability of formats, and the potential for social learning and self-study. The community of practice forming around the use of the EM&ES open textbooks has enormous potential for growth even though it can be classified as an Active Community at this point in time.

5.4 Recommendations for actions

Some teachers naturally assist each other, but those who will get the most out of the EM&ES open textbooks and other related OER, are those that get involved in the creation, adaptation and update process. There are many ways to be involved but here are my starting recommendations:

- Teachers could start their own CoPs, with like-minded colleagues, either online or on-site, and share knowledge gained from using the EM&ES open textbooks, OER and technology in general.
- Teachers could be more actively involved in adding to the *Fullmarks* bank of questions and answers, and the use of the Annotate feedback feature.
- Teachers, or other volunteers, could assist Siyavula in producing those Teachers' Guides that are still outstanding.
- Education authorities, schools and colleagues, need to support teachers in the use of ICTs, as not all teachers are equally confident using technology, and they need to have some time to experiment and collaborate to find the best ways to work with technology.

5.5 Recommendations for further research

The EM&ES open textbooks are being used, and further research could explain how and why other creators of OER could use similar methods, techniques or processes.

- Research access to, and use of, the EM&ES open textbooks, across the country via mobile phones and *MXit*. Figure 5.1 is a twitter comment from Mark Horner indicating the activity on *MXit*.

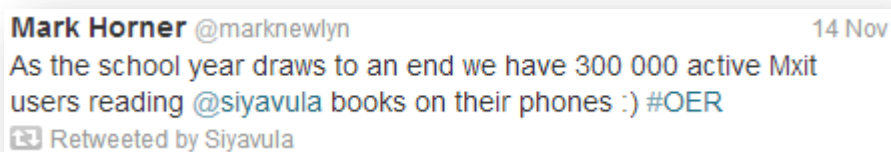


Figure 5.1 Twitter comment made by Mark Horner on 14 November 2012

- Study the collaborative authoring techniques used to create and update the EM&ES open textbooks, with a possible comparison to the creation and adaptation process of the TESSA OER described by Wolfenden et al. (2012).
- Review the sustainability of Siyavula and thus the continued availability of the EM&ES open textbooks.
- Study the actual use of printed copies distributed by Department of Education.
- Describe the technology used by Siyavula for hosting, authoring, and editing to create, store and update the EM&ES open textbooks.
- Research the influence on Maths and Science teaching in SA of the use of the EM&ES open textbooks.
- Research the available OER and technology in SA schools, in order to plan interventions.
- Study the activities aimed at creating a community of practice around the use of technology, OER and the EM&ES open textbooks.
- Tuomi suggests that open resources can “increase in value when they are used” and that not using them “may carry social costs” (2006:4). This suggests further research into how the social cost to South Africa can be measured if the EM&ES open textbooks are not used in areas of the greatest need.
- Research the learners studying Maths or Science independently, if there are no facilities to do so at the school they attend, by using the EM&ES open textbooks.
- In the longer term, research the effect the EM&ES open textbooks have on the number of South African learners choosing careers in scientific fields.

References

Allen, N. (2010). A Cover to Cover Solution: How open textbooks are the path to textbook affordability. *Student PIRGs*. Available on: <http://www.studentpirgs.org/reports/cover-cover-solution> (Last accessed on 12 January 2013)

Atkins, D.E., Brown, J.S., and Hammond, A.L. (2007) A Review of the Open Educational Resources (OER) Movement: Achievements, Challenges, and New Opportunities. Report to The William and Flora Hewlett Foundation. Available on <http://www.hewlett.org/uploads/files/ReviewoftheOERMovement.pdf> (Last accessed on 12 January 2013)

Balasubramanian K, Clarke-Okah W, Daniel J, Ferreira F, Kanwar A, Kwan A, Lesperance J, Mallet J, Umar A, West P (2009) ICTs for Higher Education: *Background paper from Commonwealth of Learning, UNESCO World Conference on Higher Education, Paris, 5 to 8 July 2009*. <http://unesdoc.unesco.org/images/0018/001832/183207e.pdf> (Last accessed on 12 January 2013)

Baraniuk, R.G. (2008). Challenges and Opportunities for the Open Education Movement: A Connexions Case Study. In Iiyoshi, T. and Kumar, M.S.V. (Eds) *Opening Up Education: The Collective Advancement of Education through Open Technology, Open Content, and Open Knowledge* (pp 229 – 246). The MIT Press, Cambridge, Massachusetts.

Biggam, J (2011) *Succeeding with Your Master's Dissertation: A step-by-step handbook*. 2nd Edition. England: Open University Press.

Bloch, G. (2009) *The Toxic Mix: What's wrong with South Africa's schools and how to fix it*. Tafelberg, Cape Town.

Brown, J.S. (2008). Foreword: Creating a Culture of Learning. In Iiyoshi, T. and Kumar, M.S.V. (Eds) *Opening Up Education: The Collective Advancement of Education through Open Technology, Open Content, and Open Knowledge* (pp xi -xvii). The MIT Press, Cambridge, Massachusetts.

Brown, J.S. and Adler, R.P. (2008). *Minds on Fire: Open Education, the Long Tail, and Learning 2.0*. *Educause Review* January/February 2008. Available on: http://webpages.csus.edu/~sac43949/PDFs/minds_on_fire.pdf (Last accessed on 12 January 2013)

Bruns, A. (2007) *Beyond Difference: Reconfiguring Education for the User-Led Age*. Paper presented at the ICE 3 (Ideas, Cyberspace, Education) conference at Ross Priory, Loch Lomond, Scotland, 21-23 March 2007. Available online : <http://snurb.info/files/Beyond%20Difference%20%28ICE%203%202007%29.pdf> (Accessed 2 December 2012)

Cape Town Open Education Declaration (2007) <http://www.capetowndeclaration.org/read-the-declaration> (Last accessed on 12 January 2013)

Cohen, L, Manion, L & Morrison, K (2007) *Research Methods in Education*. 6th edition. London: Routledge.

Cohen, L, Manion, L & Morrison, K (2011) *Research Methods in Education*. 6th edition. London: Routledge.

Conole, G., Galley, R. and Culver, J. (2011). Frameworks for understanding the nature of interactions, networking, and community in a social networking site for academic practice. *International Review of research in Open and Distance Learning*. Vol. 12.3 March 2011. Available on: <http://www.irrodl.org/index.php/irrodl/article/view/914> (Last accessed on 12 January 2013)

Davis, H.C., Carr, L., Hey, J.M.N., Howard, Y., Millard, D., Morris & White, S. (2010). Bootstrapping a culture of sharing to Facilitate Open Educational Resources. *IEEE Transactions on Learning Technologies*, 3(2), 96-109. Available on: <http://eprints.soton.ac.uk/267386/> Last accessed 12 January 2013)

Downes S (2007) Models for Sustainable Open Educational Resources: *Interdisciplinary Journal of Knowledge and Learning Objects* 3: 29-44. <http://www.downes.ca/cgi-bin/page.cgi?post=33401> (Last accessed 12 January 2013)

Ehlers, U-D., and Conole, G.C. (2010) Open Educational Practices: Unleashing the power of OER. Presented at UNESCO Workshop on OER in Windhoek, Namibia in May 2010. Available on http://www.icde.org/ru/_resources/open_educational_quality_initiative/news_from_opal/Open+Educational+Practices%3A+Unleashing+the+power+of+OER.b7C+wBfSXp.ips (Last accessed on 12 January 2013)

Eisenhardt, K.M. (1989). Building Theories from Case Study Research. *The Academy of Management Review*, Vol. 14, No. 4 (Oct., 1989), pp. 532-550. Available on: <http://www.jstor.org.ezproxy.uct.ac.za/stable/pdfplus/258557.pdf> (Accessed via UCT libraries on 12 June 2011)

Frydenberg, J. and Matkin, G. (2007). Open Textbooks: Why? What? How? When?. Paper based on the recorded proceedings of a conference held in Newport Beach, California, on 22 and 23 August 2007 with funding support from the William and Flora Hewlett Foundation. Available on: <http://www.hewlett.org/uploads/files/OpenTextbooks.pdf> (Last accessed on 12 January 2013)

Grobbelaar, C. (2012, June 22) Siyavula textbooks available for a variety of devices. Retrieved from <http://projects.siyavula.com/blog/2012/06/22/siyavula-textbooks-available-for-a-variety-of-devices/> (Accessed on 14 November 2012)

Grobbelaar, C. (2012, July 3) Siyavula's take on teaching with technology. Retrieved from <http://projects.siyavula.com/blog/2012/07/03/siyavulas-take-on-teaching-with-technology/> (Accessed on 14 November 2012)

Grobbelaar, C. (2012, July 10) Everything Maths and Everything Science available on Mxit. Retrieved from <http://projects.siyavula.com/blog/2012/07/10/everything-maths-and-everything-science-available-on-mxit/> (Accessed on 14 November 2012)

Hodgkinson-Williams, C. and Gray, E. (2008). Degrees of Openness: The emergence of Open Educational Resources at the University of Cape Town. Available on: <http://libra.msra.cn/Publication/12135675/degrees-of-openness-the-emergence-of-open-educational-resources-at-the-university-of-cape-town> (Last accessed on 12 January 2013)

Horner, M. and Blyth, S. (2008). How to collaboratively develop open-source textbooks (in hindsight!). Available on: http://download-mirror.savannah.gnu.org/releases/fhsst/FHSST_HowTo.pdf (Last accessed on 12 January 2013)

Horner, M. (2008, November 14) FHSST Release 0. Retrieved from <http://projects.siyavula.com/blog/2008/11/14/fhsst-release-0/> (Accessed on 14 November 2012)

Horner, M. (2011, December 5). What happened to the last 5 months. Retrieved from <http://www.markhorner.net/2011/12/05/what-happened-to-the-last-5-months/> (Accessed on 14 November 2012)

Horner, M. (2012, August 8) Siyavula a social enterprise. Retrieved from <http://www.markhorner.net/2012/08/08/siyavula-a-social-enterprise/> (Accessed on 14 November 2012)

Hilton III, J., Wiley, D., Stein, J. and Johnson, A. (2010) 'The four 'R's of openness and ALMS analysis: frameworks for open educational resources', *Open Learning: The Journal of Open, Distance and e-Learning*, 25: 1, 37 — 44.

Available on: <http://dx.doi.org/10.1080/02680510903482132> (Accessed via UCT libraries on 29 March 2011)

Hilton III, J., Wiley, D. and Lutz, N. (2012) Examining the Reuse of Open Textbooks. *The International Review of Research in Open and Distance Learning* Vol.13, No.2, April 2012. Available on: <http://www.irrodl.org/index.php/irrodl/article/view/1137/2130> (Accessed on 14 November 2012)

Hilton III, J., and Laman, C. (2012) One college's use of an open textbook. *Open Learning: The Journal of Open, Distance and e-Learning*, 27:3, 265-272. Available on <http://dx.doi.org/10.1080/02680513.2012.716657> (Accessed via UCT libraries on 14 November 2012)

HSRC (2011). HSRC: Statement by the Human Sciences Research Council, on the 2010 Matric results (06/01/2011). Available on:

<http://www.polity.org.za/article/hsrc-statement-by-the-human-sciences-research-council-on-the-2010-matric-results-06012011-2011-01-06> (Last accessed on 12 January 2013)

Issack, S.M. (2011) OERs in Context – Case Study of Innovation and Sustainability of Educational Practices at the University of Mauritius. Available on: http://www.eurodl.org/materials/contrib/2011/Santally_Mohammed_Issack.htm (Last accessed on 12 January 2013)

ITnewsAfrica (2008). Rice-African partnership is open-education blockbuster. Published on Monday 10th November 2008. Available on: <http://www.itnewsafrika.com/2008/11/rice-african-partnership-is-open-education-blockbuster/> (Last accessed on 12 January 2013)

Johnstone, S. (2005). Open Educational Resources Serve the World: Sharing educational resources over the Internet provides multiple benefits, from academic collaboration to economic development. *Educause Quarterly*, Number 3 2005. Available on: <http://net.educause.edu/ir/library/pdf/eqm0533.pdf> (Last accessed on 12 January 2013)

Kim, S., Hong, J., Suh, E. (2012) A diagnosis framework for identifying the current knowledge sharing activity status in a community of practice. *Expert Systems with Applications* 39 (2012) 13093-13107. Elsevier. Available on <http://dx.doi.org/10.1016/j.eswa.2012.05.092> (Downloaded via UCT libraries 14 September 2012)

Lane, A. (2008). Widening participation in education through open educational resources. In Iiyoshi, T. and Kumar, M.S.V. (Eds) *Opening Up Education: The Collective Advancement of Education through*

Open Technology, Open Content, and Open Knowledge (pp 149 – 163). The MIT Press, Cambridge, Massachusetts.

Lave, J. (1991) Situated Learning in Communities of Practice, Chapter 4 in: Perspectives on socially shared cognition. Available on: <http://www.udel.edu/educ/whitson/files/Lave,%20Situating%20learning%20in%20communities%20of%20practice.pdf> (Last accessed on 12 January 2013)

Lave, J. and Wenger, E. (1991) Situated Learning: Legitimate peripheral participation. Cambridge University Press.

LeCompte, M.D. (2000) Analyzing Qualitative Data. *Theory into Practice*, Vol. 39 No.3. Available on: <http://web.ebscohost.com.ezproxy.uct.ac.za/ehost/pdfviewer/pdfviewer?vid=4&hid=104&sid=5019cd06-39be-465d-a1b8-fc588663fc68%40sessionmgr104> (Accessed on 16 April 2011 via UCT libraries)

Li, K.C., & Yuen K.S. (2012) Development of Open Educational Resources in Hong Kong: A status analysis. Proceedings of the Regional Symposium on Open Educational Resources: An Asian perspective on policy and practices. Available on: https://oerknowledgecloud.org/sites/oerknowledgecloud.org/files/OERAsia_Symposium_Penang_2012_Proceedings-6.pdf (Last accessed 12 January 2013)

Maxwell, J A (2005) *Qualitative research design: An interactive approach*. 2nd edition. London: Sage.

Marshall, D. (2009) Mind the Gap: Some reflections on STEM at the interface between school and higher education. Proceedings of an Academy of Science of South Africa Forum: CRITICAL ISSUES IN SCHOOL MATHEMATICS AND SCIENCE: PATHWAYS TO PROGRESS. Held from 30 September to 2 October 2009 at the University of Pretoria, Edited by Diane J. Grayson, Published by: Academy of Science of South Africa (ASSAf). Available on: <http://www.assaf.org.za/wp-content/uploads/2010/10/STEM-final-web.pdf#page=17> (Last accessed on 12 January 2013)

Nash, B. (2010, September 13) FHSST books proof reading marathon hackathon . Retrieved from <http://projects.siyavula.com/blog/2010/09/13/fhsst-books-proof-reading-marathon-hackathon/> (Accessed on 14 November 2012)

Nash, B. (2011, July 11) Afrikaans translation day of FHSST at Stellenbosch University. Retrieved from <http://projects.siyavula.com/blog/2011/07/11/afrikaans-translation-day-of-fhsst-at-stellenbosch-university/> (Accessed on 14 November 2012)

Oloruntegbe, K.O., Akinsete, A.M., Ayeni, E.O., Odutuyi, M.O., and Alam, G.M. (2010). Rethinking development and sustainability of African economy: The roles of science education. *African Journal of Business Management* Vol. 4(6), pp. 811-819, June 2010. Available on: <http://academicjournals.org/ajbm/PDF/pdf2010/June/Oloruntegbe%20et%20al.pdf> (Last accessed on 2 May 2011)

Petrides, L., Jimes, C., and Nodine, T. (2007) Building Open Educational Resources from the Ground Up: South Africa's Free High School Science Texts. Available on: [http://oer.issueelab.org/research/listing/building open educational resources from the ground up south africa's free high school science texts](http://oer.issueelab.org/research/listing/building%20open%20educational%20resources%20from%20the%20ground%20up%20south%20africa's%20free%20high%20school%20science%20texts) (Last accessed on 12 January 2013)

Petrides, L., Nguyen, L., Jimes, C. and Karaglani, A. (2008). Open educational resources: inquiring into author use and reuse. *Int. J. Technology Enhanced Learning*, Vol. 1, Nos. 1/2, pp. 98-117.

Available on <http://inderscience.metapress.com/content/9428665670616423/98-117>. (Last accessed on 12 January 2013)

Petrides, L., Jimes, C., Middleton-Dezner, C., Walling, J., and Weiss, S. (2011). Open textbook adoption and use: implications for teachers and learners. *Open Learning: The Journal of Open, Distance and e-Learning*, Vol. 26, No.1, 39-49. Available on: <http://www.informaworld.com/smpp/section?content=a932406300&fulltext=713240928> (Accessed via UCT libraries on 29 March 2011)

Prabhala, A. and Caine, C. (c2004). Memorandum on the Free Trade Agreement negotiations between the United States and the Southern African Customs Union. Available on: <http://ibt.afrihost.com/accessof/files/us-sacu-fta.doc> (Last accessed on 12 January 2013)

Price, M. and Clark, J (2011) No quick fix for the crisis in our schools. Published in the Sunday Times on 31 July 2011.

Richter, T. and Ehlers, U.D. (2010). Barriers and Motivators for using Open Educational Resources in Schools. In *Open Ed 2010 Proceedings*. Barcelona: UOC, OU, BYU. Available on: <http://hdl.handle.net/10609/4868> (Last accessed on 12 January 2013)

Sapire, I. (2010) Investigating the take-up of Open Educational Resources for Maths Teacher Education: a case study in six Higher Education sites in South Africa. A paper in the 18th Annual meeting of the Southern African Association for Research in Mathematics, Science and Technology Education. Held 18-21 January 2010 at the University of Kwazulu-Natal. Available on: http://www.sdu.uct.ac.za/usr/sdu/downloads/conferences/saar_mste2010/shortpapervol2.pdf#page=164 (Last accessed 12 January 2013)

Sapire, I. and Reed, Y, (2011) Collaborative design and use of open educational resources: a case study of mathematics teacher education project in South Africa. *Distance Education* Vol. 32, No. 2, August 2011, 195-211 Available on: http://www.eric.ed.gov/ERICWebPortal/search/detailmini.jsp?_nfpb=true&_ERICExtSearch_SearchValue_0=EJ953001&ERICExtSearch_SearchType_0=no&accno=EJ953001 (Last accessed 12 January 2013)

Siyavula. (2008, April 14) A new initiative – Siyavula. Retrieved from <http://projects.siyavula.com/blog/2008/04/14/a-new-initiative-siyavula/> (Accessed on 14 November 2012)

Smith, M. (2010). Which in and out of school factors explain variations in learning across different socio-economic groups: Findings from South Africa. *EdQual Working Paper No.24*. Available on: http://www.dfid.gov.uk/r4d/PDF/Outputs/ImpQuality_RPC/edqualwp24.pdf (Last accessed on 12 January 2013)

Thomas, G. (2011) A Typology for the Case Study in Social Science Following a Review of Definition, Discourse, and Structure. *Qualitative Inquiry* 2011 17: 511. Sage. Available on: <http://qix.sagepub.com/content/17/6/511> (Last accessed on 12 January 2013)

Tuomi, I (2006) Open Educational Resources: What they are and why do they matter. Report prepared for the OECD in October 2006. Available on: http://www.meaningprocessing.com/personalPages/tuomi/articles/OpenEducationalResources_OECD_report.pdf (Last accessed on 12 January 2013)

UNESCO (2002) Forum on the Impact of Open Courseware for Higher Education in Developing Countries. Paris, 1-3 July 2002. Available on: <http://unesdoc.unesco.org/images/0012/001285/128515e.pdf> (Last accessed 12 January 2013)

Wenger, E. (1998). *Communities of Practice: Learning, Meaning, and Identity*. Cambridge University Press.

Wenger, E. (2006). *Communities of Practice: A brief introduction*. Available on: <http://wenger-trayner.com/wp-content/uploads/2012/01/06-Brief-introduction-to-communities-of-practice.pdf> (Last accessed on 12 January 2013)

Wiley, D. and Gurrell, S. (2009) 'A decade of development...', *Open Learning: The Journal of Open, Distance and e-Learning*, 24: 1, 11 — 21

Available on: <http://dx.doi.org/10.1080/02680510802627746> (Accessed on 29 March 2011 via UCT Library)

Wiley, D. (2009) Open education license draft. Available on: <http://opencontent.org/blog/archives/355> (Last accessed 12 January 2013)

Wiley, D., Hilton III, J.L., Ellington, S. and Hall, T. (2012) A Preliminary Examination of the Cost Savings and Learning Impacts of Using Open Textbooks in Middle and High School Science Classes. *The International Review of Research in Open and Distance Learning* Vol.13, No.3, June 2012. Available on <http://www.irrodl.org/index.php/irrodl/article/view/1153/2256> (Accessed on 14 November 2012)

Wolfenden, F. (2008) The TESSA OER Experience: Building sustainable models of production and user implementation. *JIME Special Issue: Researching open content in education. May 2008*. Available on: <http://jime.open.ac.uk/2008/03> (Last accessed on 12 January 2013)

Wolfenden, F., Buckler, A. and Keraro, F. (2012) OER Adaptation and Reuse across cultural contexts in Sub Saharan Africa: Lessons from TESSA (Teacher Education in Sub Saharan Africa). *Journal of Interactive Media in Education*. Available on <http://oro.open.ac.uk/id/eprint/31443> (Accessed on 14 November 2012)

Yuan, L., MacNeill, S. and Kraan, W. (2008). Open Educational Resources - opportunities and challenges for higher education. *Joint Information Systems Committee (JISC) CETIS*. Available on <https://oerknowledgecloud.org/?q=content/open-educational-resources-%E2%80%93-opportunities-and-challenges-higher-education> (Last accessed 12 January 2013)

Zietsman, E. (2012, April 16) We've updated the Annotation system for our online books. Retrieved from <http://projects.siyavula.com/blog/2012/04/16/weve-updated-the-annotation-system-for-our-online-books/> (Accessed on 14 November 2012)

Appendix A – letter to Research Directorate, WCED

To: Dr. Audrey Wyngaard
Research Directorate
WCED

From: Erna Theresa Cartmill
UCT Student no: CRTERN001
25 Amethyst Street,
Stellenridge, 7530

May 2012

Re: Permission to undertake research in a WCED school

Permission is hereby sought to use information towards a minor dissertation for the Master's degree, ICTs in Education, offered by the University of Cape Town. The key focus of the research is to investigate how teachers use the Free High School Science Texts (FHSST) Open Educational Resources (OER). FHSST have been renamed to Everything Science and Everything Maths, so the title of my dissertation might change to accommodate the name change.

This qualitative study aims to gather data by means of interviews teachers to find out how they use, and are supported in their use of, the Everything Science and Everything Maths open textbooks.

Initially I was only going to interview teachers at independent schools as those were identified for me, but, with the Department of Basic Education printing and distributing the Everything Maths and Everything Science textbooks, it would be unthinkable for me not to include at least some teachers now using these OER as a result. I now intend to interview teachers from private schools and from government schools. I will interview the teachers at their convenience, out of school hours, and therefore not impact the teaching and learning process. I also give an undertaking to adhere to the ethics codes pertaining to this type of research and assure the WCED that all information will be treated with the strictest confidentiality.

Participants will be informed of the aims, objectives and methods of the research. They will also be guaranteed confidentiality and the right to withdraw from the research at any time.

I request that permission be granted to interview Maths and/or Science teachers at XXXXXXXXXXXX. Please note that permission will be sought from the Principal once permission has been granted by the Research Directorate of the Western Cape Education Department.

Thanking you in anticipation.

Kind regards

Tess Cartmill

Contact: 082 856 6861 or tess.cartmill@gmail.com

Appendix B – Example of Permission from WCED



Directorate: Research

Audrey.wyngaard2@pgwc.gov.za
tel: +27 021 476 9272
Fax: 0865902282
Private Bag x9114, Cape Town, 8000
wced.wcape.gov.za

REFERENCE: 20120521-0060

ENQUIRIES: Dr A T Wyngaard

Mrs Erna Cartmill
School of Education
Faculty of Humanities
UCT

Dear Mrs Erna Cartmill

RESEARCH PROPOSAL: THE ROLE OF A COMMUNITY OF PRACTICE IN PROMOTING THE USE OF OPEN EDUCATIONAL RESOURCES: A CASE STUDY OF TEACHERS' USE OF THE EVERYTHING MATHS AND EVERYTHING SCIENCE OPEN TEXTBOOKS

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Approval for projects should be conveyed to the District Director of the schools where the project will be conducted.
5. Educators' programmes are not to be interrupted.
6. The Study is to be conducted from **22 May 2012 till 30 June 2012**
7. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December).
8. Should you wish to extend the period of your survey, please contact Dr A.T Wyngaard at the contact numbers above quoting the reference number?
9. A photocopy of this letter is submitted to the principal where the intended research is to be conducted.
10. Your research will be limited to the list of schools as forwarded to the Western Cape Education Department.
11. A brief summary of the content, findings and recommendations is provided to the Director: Research Services.
12. The Department receives a copy of the completed report/dissertation/thesis addressed to:
The Director: Research Services
Western Cape Education Department
Private Bag X9114
CAPE TOWN
8000

We wish you success in your research.

Kind regards.

Signed: Dr Audrey T Wyngaard
for: **HEAD: EDUCATION**
DATE: 21 May 2012

Lower Parliament Street, Cape Town, 8001
tel: +27 21 467 2000 fax: +27 21 467 2996
Safe Schools: 0800 45 46 47

Private Bag X9114, Cape Town, 8000
Employment and salary enquiries: 0861 92 33 22
www.westerncape.gov.za

Appendix C – Example of permission received from principals

Interview Agreement Form - Principal

I, _____ Principal of _____
agree that Tess Cartmill may interview some of our teachers.

I understand that these interviews form part of a research project, *"The role of a community of practice in promoting the use of Open Educational Resources: A case study of South African teachers use of the Everything Science and Everything Maths open textbooks"* for Tess Cartmill, a student at the University of Cape Town.

I understand that Tess Cartmill may use the information from these interviews.

I understand that the teacher(s) and the school will be given pseudonyms and that identities will remain anonymous, as far as is possible.

I understand that the interview will be recorded so that Tess Cartmill may more accurately reflect the teachers' views in her thesis.

I understand that the teacher(s) will be given the opportunity to read and correct the transcript of the recorded interview.

I understand that the interview transcripts will not be shared with other participants.

I understand that Tess Cartmill will share the findings with the teacher(s).

I understand that the teacher(s) may discontinue participation at any stage of the research.

I understand and agree to the above terms and conditions.

Signature (Principal) _____ Date 31.05.2012

Signature (Researcher) _____ Date 04.06.2012

Appendix D – Example of permission received from teachers

Interview Agreement Form

I, _____ agree that I am participating willingly and voluntarily in an interview with Tess Cartmill on this day 04/06/12 (date) at _____ (place).

I understand that these interviews form part of a research project, "*The role of a community of practice in promoting the use of Open Educational Resources: A case study of South African teachers use of the Everything Science and Everything Maths open textbooks*" for Tess Cartmill, a student at the University of Cape Town.

I understand that I will participate in one one-hour interview.

I understand that Tess Cartmill may use the information from these interviews.

I understand that I will be given a pseudonym and that my identity will remain anonymous, as far as is possible.

I understand that the interview will be recorded so that Tess Cartmill may more accurately reflect my views in her thesis.

I understand that I will be given the opportunity to read and correct the transcript of the recorded interview.

I understand that the interview transcripts will not be shared with other participants.

I understand that Tess Cartmill will share the findings with me. I understand that I need to give Tess Cartmill my contact details so that she can contact me when the findings are available. I also understand that the findings will not be available immediately.

I understand that I may discontinue my participation at any stage of the research.

I understand and agree to the above terms and conditions.

Signature (Participant) _____ Date 04/06/12

Signature (Researcher) _____ Date 4/6/2012

Appendix E – Example of transcript

1 Interview with SCHOOL C teachers – 4th June 2012

2 TC: I think I'm going to go around in a circle until we get our rhythm.

3 TC: How did you find out about Everything Maths and Everything Science?

4 Reinier: We were told by our director of technology, Ivor ... and that is basically the way I
5 learnt about it.

6 Evelyn: I went to one of Siyavula's evening presentations, they had it in town at their offices
7 there, and ... it was last year, and there were a whole lot of other teachers there as well, and
8 they were showing us what they've got, the textbooks that were available and the ones that
9 they were still working on, and that's how I was introduced to the Everything Science and
10 Everything Maths textbooks.

11 Ann: I was introduced through Ivor (director of technology)

12 Harold: Same

13 Ingrid: Much the same, a combination of workshops at Siyavula and the school in general.

14 TC: How do you access Everything Maths or Everything Science? (1:19)

15 Ingrid: Via the internet. I use the online version on my MacBook. In the class ... I teach the
16 matrices and not all of them have laptops yet, our grade 10s, most of them do, because we've
17 got a sort of rollout system where year by year, most of the learners as they come through
18 will have their own laptops. But at the moment, the matrices are the top end of the school, so
19 not many of them do. But I project the content to the screen and we work from that and the
20 learners use the textbooks, they all, or almost all, have internet access at home. (TC: They
21 don't have printed copies?) We gave them the option of ordering copies, printed copies, and
22 possibly about half of the learners did, and half didn't. So really in the grade 12 group we are
23 not using the hard copies in class that much, because a lot of what we do in class is practise
24 problems rather than look at content anyway. (2:36) I tend to present an introduction to the
25 content myself and I may use parts of the Siyavula text to do that initial presentation, but
26 after that I would say, probably 90% of our class time is practising problems, rather than
27 working through text. (TC: But this is their primary textbook?) It is their primary text, ja.

28 Harold: Basically what I did was, I downloaded the books off the internet, because it is a free
29 book, and we also use it in class. I teach the grade 11 group and all of them have got
30 MacBooks so we ... I project the work and then teach the work (3:21) according to the
31 projection, and then during class any exercise that needs to be done or any work they need
32 to revisit, they use their Macbooks for that. That's how I work with it. (TC: They have printed
33 copies?) I've only got about 3 or 4 learners with printed copies, they prefer printed copies, I
34 think they prefer to high-light something or they struggle with the Macbook in terms of effort
35 etc. But as they progress with the Macbook they are getting more comfortable with it ... but
36 there are still those few learners who are not comfortable with it ... not many.

37 Ann: I have a copy of the books on my desktop, of my Macbook, and I project them on the
38 screen, and the learners use Macbooks and ipads and some have printed books as well
39 (TC: Do any use mobile phones?) No, I don't think so.

40 Evelyn: I've got an interesting scenario, my grade 10s, I've got 34 grade 10s, and I was very
41 interested to see how many asked for the hardcopies, versus the softcopy. In a class of 34,
42 about 2 or 3 kids have gone just for the softcopy, the rest all have hardcopies. And I think it's
43 like a safety security blanket kind of scenario, where they want (4:51) the hard copy even
44 though every day I project it onto my ... on a daily basis ... if I were to use something like
45 Ingrid does, I would project it and then project homework from the actual exercise in the
46 textbook ... That is our primary textbook ... and show the answers on the board as well. So I
47 work with it personally, but, ja, I think my grade 10s particularly ... we've had a good few
48 discussions about it, and they like to be able to sit there and high-light it ... actually physically
49 hold the page in their hands (TC: Do you think it's because of the fact that it's a newer copy
50 of the textbook, that's now CAPS aligned and all that, or ... for your Grade 10s, because
51 that's the most up-to-date?) Why I'm using it? (TC: Why they ... or are they not even aware?)
52 No, that's not why they are using it. I think it is just the security of having a hardcopy ... ja ... I
53 was surprised by it actually. Considering that they do so much on their Macbooks and their
54 phones, yes some of them do access it on their phones, and some of them do access it
55 online, and yet most of them bought it ... the hardcopy.

56 Reinier: (8:03) Well ... I have the grade 10s, 11s and 12s. We have the book, also on my
57 notebook, also on my desktop, on my Macbook as well ... and the learners have access to
58 the internet, via the intranet ... and I think most of them, in grades 10 and 11, did actually
59 prefer buying the hardcopy as well. Security situation as well ... And sometimes you have
60 people who have their internet giving problems at home ... and if that's the case, I'd make
61 copies for them of some of the pages. We also project them on the screen, while we're busy
62 doing teaching and so on, and they ... I think some of them find that ... because the answers
63 aren't in the book in maths, at the back, I think it upsets them sometimes ... because most of
64 them are using the hardcopy version. Grade 12 there are 1 or 2 having it on their ipads as
65 well, and they can access it from there as well. For those that don't have Macbooks, they've
66 got laptops and so on and they've got access at home.

67 TC: Anyone have any specific (7:19) benefits or challenges around access, specifically with
68 the host site or where the software is? ...anything that's like difficult to do?

69 Ingrid: Even with the internet down, most of them have downloaded it. So you may not have
70 the interactive online version for that moment, but they still have a copy, which is a more
71 updated copy than a hardcopy. That hasn't really been a problem. Um ... There have been
72 more practical issues ... (TC: practical issues are very relevant) Working with the grade 12
73 book, it's obviously not as updated as the grade 10 one, so there have been a number of
74 issues. The one is that almost monthly, things change, and improve ... originally you weren't
75 able to click on a chapter and go straight there, you had a very long scroll down section ...
76 that improved with time ... um... my main problem is that there is a lot of content in the book
77 that is not examinable. And it's not clearly marked out. And that worries me a lot for other
78 learners in the country, who may not have teachers who are guiding the learners, and they
79 may be learning work that is completely irrelevant for their final exam. So I think that's a
80 huge issue. I don't understand, I have addressed it with Siyavula already and I'm not sure
81 why that hasn't been changed ... instantly. (9:05) And then the numbers of questions, there
82 isn't sufficient practise for each section, and again the learners are used to access, as
83 Reinier said, the answers. I find it a bit clumsy, having to put in a code in order to get to an

84 answer. And also the way the questions are numbered is completely ... question 1, 2, 3 and
85 then the answers 1 to 8 ... there isn't a clear numbering system, which is also irritating. It's
86 such a practical thing to create (9:41) ... they're teething problems and I'm sure in years
87 going forward it will be smoother. But like I said, my matrices in particular, they don't have
88 laptops. I can only project it to them, they can't go forwards and backwards ... you know
89 some learners would want to go back and check on something ... so it's been a little bit
90 awkward. I think just from a teacher's point of view it would be nice to have more training in
91 terms of tips and skills, in terms of actually making ... it's such a new ... for someone who's
92 always used hardcopy textbooks ... you don't just plunge in naturally. I naturally reach for my
93 pen and start explaining ... one needs practise and exposure to methods of using the books
94 more effectively. Which I think possibly ... you know Evelyn and Harold have learners with
95 laptops ... some of the learners in grade 11 are editing ... my 12s are nowhere near that,
96 because they don't have their laptops, so my learners experience will be very different to
97 others. (TC: thanks Ingrid) (10:56)

98 TC: Let's go to why you are using Everything Maths and Everything Science

99 Ingrid: Well to start with we do have a one-to-one laptop program in the school and it clearly
100 makes sense to not be buying a whole lot of additional heavy textbooks, when they have
101 laptops (TC: so the digital ... electronic reason) So it makes sense given the direction that
102 the school is taking. But on top of that the embedded ... the media enriched aspects. I have
103 been able to show podcasts and video clips, and things like that, that do enhance the
104 lesson. And we have the technology to do that so it just makes sense to be doing it. You
105 know we can search YouTube for our own clips, but to have had somebody else ... you've
106 got this huge mass of stuff out there ... so to have had other people who have already
107 trawled and found the best ... it's a huge help.

108 Harold: (12:10) Just to go back a little bit. I look forward to the day when we've got the end
109 product. I think ... 90% has been great, but there has been that 10% where we've been
110 struggling with the variety of questions and answers etc ... that type of stuff. Why am I using
111 it? We are an IT based school and that's the way forward for us and that's one of the big
112 reasons we are using it. I don't just use Everything Science per se, I've got many textbooks
113 that I use as well, but that is my main format that I am using, and it's because the learners ...
114 because we're IT based, and that's the way forward, that's one of the reasons we're using it
115 ... as an e-book ... and it's working quite nicely.

116 Ann: (TC: Why do you use it, apart from the school's reason?) I think that Ingrid has said,
117 virtually everything that's beneficial of using the e-book. I just would re-iterate that we do
118 have to supplement the examples, the exercises, there's not a lot of examples that they can
119 work through ... and the variety is not ... it doesn't always encompass everything that they
120 need to be able to do. By the way, we're Maths teachers.

121 TC: I just want to say that if you think of anything, even if it's not on the specific question that
122 I'm asking, just say it as well. (13:39)

123 Evelyn: (TC: Why do you ...?) Ok, these are my reasons. First of all, it's free. (we laugh) So
124 there's no cost involved, and I am a mother as well, so I might as well use them ... it's free of
125 charge, and like Harold said, or Ingrid said, there's not another extra book to carry, and

126 these books are heavy, and they cost a lot of money, and for me that's obviously a very
127 important point. And last year I started to use videos, and YouTube videos to embellish my
128 lesson. Now it's embedded and they're very good ... I had gone through stuff that was so
129 rubbish in the past and I ... and these are all good ... and then ... so it saves me time, sifting
130 through some terrible videos on YouTube. It also ... one of our ladies that trains us in IT ...
131 what she's taught us is, what they call flipping the class ... you let the kids go and watch the
132 videos at home, and then you use the class time to practise problem solving, and exercises
133 and that ... and this allows you to do that. So I can say to them (14:49) ok so this is where
134 we are in the book now ... because I actually follow the textbook as it goes, according to the
135 CAPS ... and then I say: for tomorrow's lesson you need to go and watch this video, and
136 then we're going to discuss it and work through and so on. I have tried that as well. I don't do
137 it all the time, because ... it depends (TC: Do they all have access to the ...?) I first check
138 that, ja, so if it's a class ... I actually check with them before the time, if they have access,
139 and they do. So then I'll do it.

140 Reinier: Well, we are going the digital way. We are there. (15:25) We've gone a long way
141 already, but sometimes ... there are still things, as Ann has said ... the grade 10, 11 and 12
142 books, there's always something you need to supplement, especially at the examples in
143 grade 12 ... you have to find your own more challenging examples, that aren't in the book ...
144 and also that sometimes explain things in a different way ... I always supplement whatever it
145 is we have to do ... there are also examples in the book that I use ... as Harold was saying,
146 I'd like to see the final product and see what happens. But it is already I think a challenge
147 getting around that. I think it's nice to use ... and they don't have to carry around books all
148 the time for the learners. I think in the long run it will be great.

149 Ivor: And it's greener. (16:28) (we laugh)

150 TC: I have a question here that says HOW are you using Everything Maths and Everything
151 Science? But I think that you have replied to that ... everybody ... so it is the only textbook,
152 not the only textbook, the primary textbook ... and the links to the videos and simulations ...

153 Ingrid: If I could maybe just add in there? In matric, although it is our primary textbook, we do
154 have a small practise book, with practise examples, that is a small A5 hardcopy (17:09) so
155 that has helped in terms of the supplementing (TC: so you're using something else to
156 supplement the Everything Maths?), yes we do have the practise book.

157 Reinier: I'd just like to add something there ... we've placed a lot of old papers on the
158 intranet, and also the solutions are there, that's from the DOE and so on, and also textbooks,
159 because of course you never have the perfect textbook, you're always trying to take the best
160 ones and put together what you can, and use them as supplements ... it's always interesting
161 to see what other options there are in the e-book that you can use.

162 TC: Any other thoughts on how you're using the books that you haven't maybe mentioned
163 before?

164 Ivor: You need very brave forward thinking teachers (18:05) ... willing to deal with the
165 challenges in the class

166 TC: And how are you assisted or do you assist others in using the Everything Maths and
167 Everything Science?

168 Reinier: Well ... (TC: who helps you?) well your colleagues, whenever you need something. I
169 have also assisted the others as far as I could, especially as I am head of the Maths
170 department, especially the grade 12s, whenever they need something, you need to ...
171 especially with supplementing as well. But as far as the e-book itself is concerned, there's no
172 problem using it ... I mean it's straight-forward. We'll see how we progress, say looking at
173 grades 11 and 12 next year (19:08) ... Then we can see if problems have been sorted out.

174 Evelyn: I wanted to say Mark Horner has also been to our school more than once ... we've
175 met ... he even spoke to our learners ... last year and this year, and he has come to assist us
176 in that way ... and we are on the Siyavula mailing lists, so if they have workshops, they let us
177 know ... and we're welcome to attend and ask questions if we want to, and we have an IT
178 department that is also very jacked up, if that's the right word ... they assist us if they can, so
179 if there is something I need to know I can go to them. But what we also do is, amongst
180 ourselves ... like I went to Harold's class one day and he showed us how his students high-
181 light things ... we just (TC: help each other ...)

182 Ann: I think much the same as what Reinier and Evelyn have said, but I think even ... Reinier
183 and I attended a CAPS conference, like a training session, a DOE training session and we
184 said to the teachers there, other teachers from schools that didn't have textbooks that they
185 should use them. And I understand that there are a lot of schools without textbooks that are
186 using them, and they're using mobile phones.

187 Harold: much the same

188 Ingrid: I've got (20:45) teacher friends who were unaware of this recourse and I've certainly
189 mentioned it ... you know, teachers get busy, and people don't necessarily know about this
190 and what they have got to offer. So ... much the same as everyone else ... in terms of
191 discussing among ourselves. I certainly feel that I could do with more training in terms of ...
192 just getting more familiar with aspects, like the high-lighting and editing of the text, but also
193 because it's a ... my own grade 12 one is a working document, a lot of the things keep
194 changing, and one discovers that, by trial and error ... um ...in terms of getting the codes to
195 get at answers and things like that. So on-going training would be good.

196 TC: Do the learners know that you use an open textbook? And what do they ...do they
197 participate, do they enjoy it, do they ...

198 Evelyn: Is the emphasis on open or just...? (TC: Ja ... like they can actually comment, they
199 can point out errors and ultimately that'll get fixed or ...) oh ok.

200 Ann: I know when Mark Horner came, he did speak about how to high-light errors that we
201 found, but I must admit I have found errors and I haven't done that because I don't
202 remember how to do it, plus it's a time consuming thing and yes (22:39) some of the learners
203 have found errors sometimes as well, but ... but ja, I didn't actually know that other than
204 them telling me and then I can perhaps edit or note it or high-light it, that they could.

205 IC: um ... just an aside. (4:55:00) I'm assisting nas a lot to do with the community or practice
206 and I'm just wondering what your thoughts are on the Department of Basic Education
207 actually introducing these books to schools, actually printing copies ... because you're
208 experienced teachers you probably have some thoughts on that.

209 Ingrid: Again, my main concern is matrices, if you got textbooks with a lot of content that's not
210 examinable. A lot ... possibly a fifth, or sixth (TC: but still better than no textbooks at all) For
211 sure.

212 TC: There's a technical phrase for using open educational resources, they talk about the "re-
213 use" of an OER, but as far as I'm concerned it's the "use" of, especially when it comes to a
214 textbook, because you're not using someone's old thing, you're using the knowledge. Um ...
215 What are your thoughts on the USE, how do you ...? I think ... You've mainly covered all the
216 issues on how you use ... as-is ... the textbooks. And also the challenges thereof. Then ... Is
217 there anybody here actually adapts Everything Maths or Everything Science to make it more
218 suitable for their learners? (24:35)

219 Evelyn: I just want to say something about adapting. Last year we had a meeting with Mark
220 of Siyavula, myself, Ingrid and Harold, and we wanted to put together our own textbook,
221 because we wanted to piece certain topics, for example that we thought could be taught in
222 grade 10 that are in the grade 11 textbooks for example, so we wanted to make our own
223 version of it ... but I think we ... what did we do ... (Ingrid: CAPS happened) and so CAPS ...
224 they are SO prescriptive, it's amazing how they can be that prescriptive, because they
225 expect you to cover this amount of work, which is way too much, for a certain amount of
226 time, and not many people can actually stick to the time in real life. So where the textbook
227 really helps (26:22) me is, I can do that exactly, I can save time by using the videos and stuff
228 like that, so that I am able to cover the CAPS syllabus in the limited time that I have been
229 allocated. So yes, so we didn't really adjust the textbook, it was the CAPS prescription that
230 put that aside.

231 TC: Any other thoughts on adaptation?

232 Reinier: If I have time, I'd like to sit down and really go through and adapt ... there are certain
233 things you can't do away with ... especially, well ... right across the FET spectrum... that's
234 what we'll have to learn as we carry on and see where we can do it. Time is an issue as well.

235 TC: the beauty of it being, that ultimately you could do that, but ... for now you're just
236 learning how to use an online book, I presume. That's the crux of the matter.

237 Ivor: Can I just say something? Talking about the Department of Education ... it is quite
238 amazing actually that they've taken this book on board (28:35) ... I think the next thing that
239 they need to do is offer free internet for those kids, because that's the big problem, they can
240 do things on mobile phones, but are they going to use their own airtime to do that. That
241 would be something ... to have some kind of airtime program for education. That would just
242 make it so much more useful.

243 TC: Does anybody combine anything of the Everything Maths and Everything Science
244 textbooks with anything else and then give it out? Do you put some of it with something else,
245 combine it with anything else, because it's electronically available?

Interview 2

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246 Harold: What I do find is ... I think we spoke about it earlier ... there are a lot of exercise
247 problems in the Everything Science ... so what I do is: I use old textbooks and supplement
248 exercises and go and then put together a whole bunch of questions and then photocopy
249 them and give it to the learners. Also there's ... you know, in your class you've got strong
250 learners and weaker learners, so the weaker learners need a lot more questions to work
251 through if you like, whereas (27:42) the strong learners will work through 1, 2, 3 questions
252 and know exactly what's going on and the weaker learners will need a lot more. So that
253 tends to be ... that's what Everything Science needs to basically look at ... having a lot more
254 questions. We also ... if I can just say this ... we also use Nutshell, which is a little summary
255 book, that we use for the learners. They actually purchase this book, and there are
256 supplementary exercises in there that we work through, as well. So they've got their e-book,
257 the electronic book, and they've got this little question and answer book as well that they use
258 (28:12) and I think it's been working fairly successfully in the FET grade 10, 11 and 12.

259 Reinier: Can I just add something? About the additional resources and so on, and the book
260 Nutshell ... we always in the past 2 or 3 years had the kids ordering the answers to these
261 books as well for them to practise on, and normally old papers, plus the solutions ... but you
262 have to have more problems, as I said before, especially more challenging stuff. I think they
263 need a bit more in terms of the different classification taxonomies, in terms of how questions
264 are asked in papers, you've got your certain percentage knowledge, then you've got routine,
265 and complex and then you've got your problem solving. You need more in every category,
266 especially towards the latter one, to make sure that the learners are prepared for the final
267 exam. You need that, and I don't think the book always has enough of that.

268 Evelyn: Can I just say (29:14) the thing is ... I don't know if I'm reading your mind ... but the
269 thing is it's an open textbook, so we're supposed to put those questions there aren't we? We
270 should be contributing those questions and answers. So I think that would probably be my
271 next ... what ... assignment ... because I think there's answers that need to be supplemented
272 ... it is a time constraint, because you need lots ... different sections of work ... I use other
273 textbooks as well to get my sets of questions, but when I go to the resource called
274 FullMarks, I've been using that a lot to draw up test and ... test questions mainly and
275 exercise questions ... and I see the same contributors ... you know there's the person's
276 name at the bottom, and I ... that for me would be the next thing, if I start contributing as well
277 (TC: that's what makes the community) ja ... that's what I was thinking ... we're all saying
278 there's not enough questions ... and when I go to their questions I see the same woman's
279 name, or the same guy's name ... and I think, ja ... the next challenge ... not challenge, the
280 next thing for me would be to contribute. (30:20)

281 TC: That was the next question that said: How do you share?

282 Evelyn: I don't, but I'd like to (laughing)

283 Harold: Do you mind if I just say something here? It's not so much a case of supplementing
284 questions ... you know, we went from a textbook last year, where we had a full textbook, with
285 questions and answers, and something that worked very well, a meaty textbook ... and then
286 we decided to change and use an electronic textbook, and obviously we're doing a bit of
287 catch-up now to try and supplement it with things ... you've got to ... we're also part of a
288 comfort zone, where we worked with a particular textbook, and it worked really well ... and all

289 of a sudden we change to an e-book, and this was out there ... there's not a lot of e-books
290 out there ... downloadable e-books ... (TC: There's ones that you can pay for) ... exactly, but
291 that's not what we wanted at the moment, and we also want to be part of the mainstream ...
292 so it's also a process, I mean it's only been going for 6 months, so I don't think we can ...

293 Evelyn: (interjected enthusiastically) It's a paradigm shift ... Harold is talking about a textbook
294 that had everything in it, now we want to have a free (31:30) ... once again we're taking but
295 we're not giving ... because that's the thought behind it ... right ... But I've not made that shift
296 yet ... I'm happy to receive at the moment. I'm not saying that to be nasty, I'm just thinking
297 about it the way he's talking about it ... we got a full textbook with everything in it ... and now
298 ... but I know what you're saying ... we want to be part of a community of practice.

299 Ingrid: If I can just add in ... not about Siyavula so much ... but answer series that we used
300 as a standard thing in the past, now the DOE has all those papers up there with the memos
301 as well, so it's another resource that one doesn't need to buy. The only bit we don't have
302 access to is the IEB papers, but all the DOE papers are there, and again the answer series
303 is not a very user friendly series ... I find it a very confusing layout (TC: The answer series for
304 Siyavula books?) No ... basically a compilation of past exam papers. But those are all now
305 available to learners online ... and so it's another shift ... it's another book we don't really
306 need to buy because it's really online and we can use (32:49)

307 Ann: I'm sorry. The answer series is not a compilation of past exam papers. Isn't it original
308 stuff?

309 Reinier: Yes , the grade 12 stuff is original, but I think the latter part ... the second half ... is
310 the old papers. (Ann: ok) IEB and DOE

311 Ingrid: I think the standard one is past papers. It's the full set DOE plus IEB.

312 Reinier: The grade 10 ... that's our original subject

313 Ivor: I was just wondering ... getting back to the original question ... do you see any
314 correlation in between the maths and the science? Do you say, for example, use some of the
315 science content in the maths ... or the maths content in the science? ... but I'm sure there's
316 more ... they'll find those correlations. But who would be responsible for putting that kind of
317 link in ... I suppose the teachers

318 Reinier: I probably ... if I'm doing something in the calculus section ... there you'll often find ...
319 I often get questions of the application of that in science ... in motion, for example ... object
320 moving ... and so on ... We can check in the science books what we can use there. But I
321 have always shown a link to the learners from the Maths that's used in calculus to the maths
322 used to do things in science.

323 Ann: Ja, some of the tools. Maths provides the tools. Can I just also mention? There's also a
324 website called KhanAcademy which I use quite a lot with my kids ... they are full interactive
325 and web-based (TC: there's also links from the ... Do you use it from the Siyavula textbooks
326 or do you use it by itself?) I use it by itself mainly. (TC: because there are also links in the
327 books) I know there are (35:22) ja ... (TC: specific subject related as it were) ja.

328 TC: So what are we all learning from this? Ingrid, what are you learning by using Everything
329 Maths and Everything Science? What do you ...

330 Ingrid: Well that these books can take us beyond hardcopy books, particularly in terms of the
331 media enriched content ... that's the main difference. The other main difference is that,
332 theoretically, errors should be able to be corrected more rapidly than with a hardcopy. We're
333 not necessarily seeing ... but I understand that there's a lot of work to be done at the
334 moment. One can't be impatient, but ... it's very frustrating for learners when they're working
335 through problems and they look at the answers in the book and the answer's wrong ... and ...
336 we get that with a lot of our hardcopies, and there were errors everywhere, it's not just in
337 Siyavula's work, it's across the board. Um ... So ja, I think those are the two key points. (TC:
338 And something that YOU're learning about? Working with the community as well?) I think
339 that's to come, I don't think we're there yet ... and I think it will be awhile. Unfortunately
340 learning skills seem so slow ... because there's so much one has to do in a normal year ...
341 the space for the improvement is kind of quite small ... but we have made big strides and
342 (37:09) I think that within the next year or two we are going to be fairly comfortably using
343 these resources.

344 Harold: I think it opens itself up to independent study ... a lot of the ... I have noticed a lot of
345 learners have actually taken to the e-books, because they are so completely ... they live in a
346 technology driven world at the moment. They've taken to opening their laptops, finding the
347 web, finding the site, finding the downloadable book and using it. I find as well, you know,
348 that kids ... laptop open ... you can have the book open, you can go into YouTube, you can
349 go into Google to search for this or that, ... so that I find works really well ... the independent
350 thing. Obviously, as Ingrid says, things will sort themselves out in time ... it's only been 8
351 months or 5 months, so ... we look forward to what's going to happen with these books, you
352 know, with the embedding of the videos ... I think with grade 10 ... I think Evelyn will probably
353 have more to say than the grade 11 and 12 teachers ... 'cause there's a lot of stuff that's not
354 embedded yet ... (TC: And learning for yourself?) Learning for myself ... look to be quite
355 honest, I'd love to sit down with the people of Siyavula and say, you know we need this
356 section to be in the book, and this section needs to be taken out ... there's a lot of stuff that's
357 in the book that doesn't need to be there, there's a lot of stuff that needs to be there ... for
358 example, I was doing a section now with acids and bases (38:54) with my grade 11s and I
359 was comparing my hardcover book that I was using last year to the book this year, and I
360 found there was a lot of stuff that wasn't in the book from last year ... which is not always a
361 bad thing ... a good thing or a bad thing ... but I think we need to look at putting a lot more
362 content into the Siyavula books, to make sure that they cover every aspect, and we should
363 be able to leave out what we don't want, or if it's too difficult, or just keep that ... but it needs
364 to be there ... (TC: You know there's an Annotate ... um ... feature, that you can use in the
365 books, and just say whatever you feel needs to ...) Ja, that's the whole thing ... we need to
366 sit down and physically ... look the Annotate I use, but I'm talking about content, that's not
367 there, but should be there, or it's a bit thin, or in some sections of the book, content is very
368 thick for example, and you don't really need to go into that much detail ... so those are the
369 things they should look at.

370 Ann: (39:59) The Annotate feature, did you mean for the kids or the teacher? (TC: both ...
371 anybody can make a comment) Ok ... I used the books quite a lot in the last quarter, I have

372 to say, that this quarter, I haven't been using the books as much as I was doing ... I have
373 been relying on quite a lot of other stuff instead of the books ... Maths is a bit different to
374 science, because it doesn't have the same kind of embedded videos and things like that. But
375 ... what am I learning? ... I don't know really (laughter) I mean, I use the books and I think
376 they're great ... I think they're a great free resource. I do use them, I do project exercises
377 (40:52) ... the kids use them themselves ... I have not contributed myself ... I think that
378 there's a lot that you're doing as a teacher ... there's lots and lots of things you have to
379 manage everyday ... so you don't always find the time to contribute yourself ... so ja, that's
380 about it. (TC: Thanks Ann)

381 Evelyn: I'm probably better at telling you what I'd like to learn. I'm not learning anything that I
382 didn't know before, but through this I'm getting to know what I still need to learn ... if you
383 know what I'm saying ... (41:31) so one of the things I'd like to learn ... like Ingrid and I spoke
384 about is how to manipulate ... like Annotate this, and high-light this ... technical things ... and
385 then the other thing that allows me to pull my different resources ... like for example
386 YouTube videos, and then there were other videos that I've discovered along the way before
387 ... and then I've got stuff on the intranet ... then I could do that ... so ... it's saving me time so
388 that I can go and learn other things and do other things. So there are things I still want to
389 learn. One of the things I still want to learn, is where there's a lack ... maybe they've already
390 got certain simulations ... maybe they've already got a way of teaching something through a
391 video or simulation, I'm now going to say ... how can I learn ... what do I need to learn to put
392 together ... like we were discussing ... a game or a simulation ... that sort of thing, that isn't
393 there yet. I'm at that stage now, I know what's there, I've been using it, but it's the things that
394 are not there, what do I have to learn, to put it there myself. I don't want to re-invent the
395 wheel either ... so I don't want to do something that's already there (42:54)

396 Reimier: I think I've learnt through ... to select is quite hard ... you have to be very selective ...
397 that's a big thing ... I think that's the main thing I've learnt from that (TC: how to be selective,
398 ja)

399 Ivor: I was just wondering: Do you find the learners more interested in these books, because
400 there's media ... because there's ...

401 Evelyn: This is their world, so I don't see them jumping up and down, because this is what
402 they're used to, so I can't compare ...

403 Ivor: But compared to the times when you had the normal books, compared to what you
404 have now.

405 Evelyn: I'm trying to think now. I had grade 10's (43:38) last year, and we worked through a
406 prescribed hard-copy book ... and this year I've got a different group ... so I can't compare

407 Ivor: Do they spend a lot of time watching the videos ... just interested to know

408 Ingrid: I've got so many grade 12s without laptops at all, so it's very awkward for me to say

409 Ivor: Is it engaging them more do you think?

410 Ann: I think ... with maths there's not the same kind of embedded videos. I here are ... there
411 are Khan Academy videos, but then it's a teacher explaining how to do ... problem solving
412 more than ...

413 Evelyn: I think I can just answer your question. I have an example. I have the grade 10
414 textbooks ... we learn about atoms and that and isotopes ... so you do a simulation when you
415 add so many protons and so many neutrons and so on ... and because I was teaching a
416 similar ... the same topic to the grade 8s, I used that simulation in the grade 10 textbook and
417 used it on the grade 8s ... they wanted some more, and some more ... so you're right (44:52)
418 ... for the class that doesn't have the textbook, the grade 8s, you're right, for them it was
419 engaging

420 Ingrid: If I could just add ... the point Harold made earlier ... about learner's doing self-
421 learning more ... I think I see that ... particularly with stronger learners in my matric group ...
422 because suddenly they have access to the textbooks ... my matrices often cellphones ...
423 because they don't have the laptops, but the better learners, will sit there and something will
424 be bothering them, something we're looking at doesn't quite make sense, the next minute
425 they've got their cellphones out and they're doing their own thing ... whereas in class before
426 they would've been frustrated ... it would've been a dead-end. So ... but that's the top-end
427 learners I find are engaging in that way. The rest ... I think it's much of the same ... I don't
428 think it really pulls them more ... but those who are irritated by a problem, will take it further.
429 (TC: thanks Ingrid, that's nice)

430 Ann: If I could agree with Ingrid. It's quite nice that they can have access to any grade
431 textbook. Like I got a strong group of Grade 11s, they could go onto a grade 12 topic and dip
432 into it. It's a nice thing for them to do. (TC: thanks Ann) (46:25)

433 TC: Ok, now the last one. Is there anything else, anybody else would like to add? ... that you
434 haven't thought of before ...

435 Reinier: Maybe I'm out of order, but we also have the Advanced program in Maths, one
436 lesson a week, and I'd love to see something in that line coming out as well, as far as the e-
437 books are concerned. At the moment of course we're using the hardcopy books ... the DOE
438 and IEB schools are using it ... it would be interesting to see if one could take your gifted
439 person a bit further ... to see what's out there ... I don't know if it will ... we've still got a tug-
440 of-war going on to see if it's going to be a subject, rather than an additional subject ... it does
441 help if people can look at what's ahead. If they are curious about something, they can look
442 that up.

443 Evelyn: I was just concerned about ... you spoke about adapting the textbook and bringing
444 other things (47-48) into it and making it your own, and for me ... there's always copyright
445 issues and how safe it is to add it to your own textbook, whereas with this, I don't have that
446 concern, if you know what I'm saying. And that puts my mind at ease. But I would like to
447 move towards being able to fetch something else, elsewhere and put it into my textbook and
448 use it again the next time. I want to be able to see how freely I can do that ... (TC: the
449 creative commons licences) that's right, I am in the dark about that (TC: so you can learn a
450 little bit more about that) ja ... (we laugh) ... because I would like to learn.

451 Ann: No more ... I don't think.

452 Harold: I'm just looking forward to the end product ... see what we can actually get out of this
453 media ... that the kids can be over-whelmed, and we can use it and bring in other resources,
454 that's what I'm looking forward to (TC: Do you think there's ever going to be an end
455 product?) (we laugh) No ... a more completed product if you like ... like with the grade 10s ...
456 better structured ... build on that ... obviously it will never be ... there won't be something that
457 is a completed end-product.

458 Ingrid: Just this realisation ... if we're going to be working as a community ... that requires
459 time where one can collaborate, and in a school ... we (49:28) ... the reality is that we can't
460 meet as a department, let alone ... there isn't one ... in our science department, we do not
461 have a single gap where we can meet to discuss what's happening in grades 9, 10, 11.
462 Never mind collaboration between subjects, never mind the bigger community issue ... so ...
463 there has to, in my mind, be a buy in, into the importance of this, in terms of making time for
464 it, and that needs to happen. (TC: Ja ... an excellent comment)

465 TC: Thank you guys very, very, very much for your time, I really appreciate it.

466 Thank you (50:12)

Appendix F – Coding examples

Community of Practice	STFLP	categories	sub category	Utterance	reference
Domain	Pedagogy	good quality content		I've yet to see a textbook that lays out the work for science and maths as clearly and instinctively as these textbooks do. Whoever hammered this thing out got it right.	Roger,Int1,Page:3,line:115-117
Domain	Pedagogy	not enough Q&A and practise exercises		but you have to have more problems, as I said before, especially more challenging stuff. I think they need a bit more in terms of the different classification taxonomies, in terms of how questions are asked in papers, you've got your certain percentage knowledge, then you've got routine, and complex and then you've got your problem solving. You need more in every category, especially towards the latter one, to make sure that the learners are prepared for the final exam. You need that, and I don't think the book always has enough of that.	Reinier,Int2,Page:7,line:26-1-267
Domain	Pedagogy	teaching issue - Not OER		Do you mind if I just say something here? It's not so much a case of supplementing questions ... you know, we went from a textbook last year, where we had a full textbook, with questions and answers, and something that worked very well, a meaty textbook ... and then we decided to change and use an electronic textbook, and obviously we're doing a bit of catch-up now to try and supplement it with things ... you've got to ... we're also part of a comfort zone, where we worked with a particular textbook, and it worked really well ... and all of a sudden we change to an e-book,	Harold,Int2,Page:7 and 8,line:283-289
Domain	Pedagogy	optimal levels of content		my main problem is that there is a lot of content in the book that is not examinable. And it's not clearly marked out. And that worries me a lot for other learners in the country, who may not have teachers who are guiding the learners, and they may be learning work that is completely irrelevant for their final exam. So I think that's a huge issue. I don't understand, I have addressed it with Siyavula already and I'm not sure why that hasn't been changed ... instantly	Ingrid,Int2,Page:2,line:76-81
Domain	Pedagogy	no teacher's guide		Non-functional requirements, the stuff that doesn't go around content is critical. Teacher's guide, there is no teacher's guide to those books ... you can't actually produce a textbook without a teacher's guide.	Roger,Int1,Page:10,line:45-8-461
Domain	Pedagogy	feedback ensures quality		Now with the closed loop system of OER where I can go and annotate and say this is minus 3 , not 3, or whatever, by the time I've iterated it once, the quality of an OER is an order of magnitude above anything commercially available, if it's got feedback.	Roger,Int1,Page:10,line:46-4-467
Domain	Pedagogy	Annotate		so they wrote in the book ... like a workbook ... which I'd like to see more of	Roger,Int1,Page:4,line:149-150

Community of Practice	STFLP	categories	sub category	Utterance	reference
Domain	Technology	interactive features		But on top of that the embedded ... the media enriched aspects. I have been able to show podcasts and video clips, and things like that, that do enhance the lesson. And we have the technology to do that so it just makes sense to be doing it.	Ingrid,Int2,Page:3,line:102-104
Domain	Technology	use enabled		Well to start with we do have a one-to-one laptop program in the school and it clearly makes sense to not be buying a whole lot of additional heavy textbooks, when they have laptops. So it makes sense given the direction that the school is taking.	Ingrid,Int2,Page:3,line:99-102
Domain	Technology	surfeit information		Science is awash with material on the web. You could spend 8 hours a day, 5 days a week, just finding science material on the web. I don't want that,	Roger,Int1,Page:2,line:70-72
Domain	Technology	on-going upgrades		Working with the grade 12 book, it's obviously not as updated as the grade 10 one, so there have been a number of issues. The one is that almost monthly, things change, and improve ... originally you weren't able to click on a chapter and go straight there, you had a very long scroll down section ... that improved with time	Ingrid,Int2,Page:2,line:72-76
Domain	Technology	restrictions		But like I said, my matrices in particular, they don't have laptops. I can only project it to them, they can't go forwards and backwards ... you know some learners would want to go back and check on something ... so it's been a little bit awkward.	Ingrid,Int2,Page:3,line:87-90
Domain	Technology	print ready formats		Oh one of the benefits: The Maths department ... they changed the mode of binding. So I would bind mine ... glue bound ... whereas the maths guys preferred to have them printed A4, they liked them big, they didn't like them small, whereas my science kids were happy with the smaller text. They could hand out section by section, and the kids could file it. And that works for that teacher, filing was better. That was also, just a ... flexibility.	Roger,Int1,Page:7,line:290-295
Domain	Technology	selection		I think I've learnt through ... to select is quite hard ... you have to be very selective ... that's a big thing ... I think that's the main thing I've learnt	Reinier,Int2,Page:10,line:396-397
Domain	Technology	enabling innovation		It also ... one of our ladies that trains us in IT ... what she's taught us is, what they call flipping the class ... you let the kids go and watch the videos at home, and then you use the class time to practise problem solving, and exercises and that ... and this allows you to do that. So I can say to them ok so this is where we are in the book now ... because I actually follow the textbook as it goes, according to the CAPS ... and then I say: for tomorrow's lesson you need to go and watch this video, and then we're going to discuss it and work through and so on. I have tried that as well. I don't do it all the time, because ... it depends ... I first check that they have access, and they do. So then I'll do it.	Evelyn,Int2,Page:4,line:130-139
Domain	Financial	cost reduction		Ok, these are my reasons. First of all, it's free. So there's no cost involved, and I am a mother as well, so I might as well use them ... it's free of charge	Evelyn,Int2,Page:3,line:123-125

Community of Practice	STFLP	categories	sub category	Utterance	reference
Domain	Financial	sustainability		they have to monetise this thing around the edge of it. You still have to pay people to maintain it, even if they're just librarians... So you have to find a viable model for that	Roger,Int1,Page:11,line:48-482
Domain	Social	knowledge sharing		but the thing is it's an open textbook, so we're supposed to put those questions there aren't we? We should be contributing those questions and answers. So I think that would probably be my next ... what ... assignment ...	Evelyn,Int2,Page:7,line:268-271
Domain	Social	individual interest		So there are things I still want to learn. One of the things I still want to learn, is where there's a lack ... maybe they've already got certain simulations ... maybe they've already got a way of teaching something through a video or simulation, I'm now going to say ... how can I learn ... what do I need to learn to put together ... like we were discussing ... a game or a simulation ... that sort of thing, that isn't there yet. I'm at that stage now, I know what's there, I've been using it, but it's the things that are not there, what do I have to learn, to put it there myself. I don't want to re-invent the wheel either ... so I don't want to do something that's already there	Evelyn,Int2,Page:10,line:388-395
Domain	Legal	open licences		I was just concerned about ... you spoke about adapting the textbook and bringing other things into it and making it your own, and for me ... there's always copyright issues and how safe it is to add it to your own textbook, whereas with this, I don't have that concern, if you know what I'm saying. And that puts my mind at ease. But I would like to move towards being able to fetch something else, elsewhere and put it into my textbook and use it again the next time. I want to be able to see how freely I can do that ...(TC: the creative commons licences) that's right, I am in the dark about that ... because I would like to learn.	Evelyn,Int2,Page:11,line:443-450
Practice	Pedagogy	Use as-is	hardcopy	I've got an interesting scenario, my grade 10s, I've got 34 grade 10s, and I was very interested to see how many asked for the hardcopies, versus the softcopy. In a class of 34, about 2 or 3 kids have gone just for the softcopy, the rest all have hardcopies. And I think it's like a safety security blanket kind of scenario, where they want the hard copy	Evelyn,Int2,Page:2,line:40-43
Practice	Pedagogy	Use as-is	online	I project the content to the screen and we work from that and the learners use the textbooks, they all, or almost all, have internet access at home.	Ingrid,Int2,Page:1,line:19-20
Practice	Pedagogy	Use as-is	digital	so what I do, I've just got a pdf file on my laptop and I use that.	Andrew,Int3,Page:1,line:22
Practice	Pedagogy	Use as-is	interactive features	I use the interactive board ... I use my high-lighter and high-light certain issues, I don't have to print. It saves one actually on printing. If I take an exemplar of another book, I will have to make a copy for them in order to give it to them, but with them having this book and me having my smart board, I can ... I use my marker, and I can high-light on the board.	Amien,Int4,Page:2 and 3,line:82-86
Practice	Pedagogy	Use as-is	mobile	yes some of them do access it on their phones,	Evelyn,Int2,Page:2,line:54

Community of Practice	STFLP	categories	sub category	Utterance	reference
Practice	Pedagogy	combine	supplement	We also ... if I can just say this ... we also use Nutshell, which is a little summary book, that we use for the learners. They actually purchase this book, and there are supplementary exercises in there that we work through, as well. So they've got their e-book, the electronic book, and they've got this little question and answer book as well that they use and I think it's been working fairly successfully in ... grade 10, 11 and 12.	Harold,Int2,Page:7,line:254-258
Practice	Pedagogy	combine	digitally	what I did is I re-structured ... in order to get around the assessment guideline that the examiner is going to use this year ... what I do is I take the content that they are going to examine, and I put that into the mind map, link the teaching material into the content area, and then with the kids ... I put a tick next to it ... have we done this ... your examiner is going to look at these 5 bullet points ... that's what he/she is going to examine you on ... Can you recognise all of that? Yes sir. We recognise ... we haven't done the exercises or we have done the exercises, but you've taught us that. And then I move through the syllabus, and by the time we get to the end of the year we have finished everything they are going to be examined on.	Roger,Int1,Page:8,line:368-377
Practice	Pedagogy	adapt	not adapted	Not really. I can't think of any. It just forms part of my, sort of, toolbox. I don't really adapt it or see the need ... I draw from other resources.	Andrew,Int3,Page:5,line:183-184
Practice	Pedagogy	adapt	no need - content good	I don't need to adapt it for the learners, ok ... it's very accessible	Roger,Int1,Page:8,line:333-334
Practice	Pedagogy	adapt	not able to adapt	they may as well have published it encrypted ... or not published ... there's not a lot about computers that scares me or that I fail on, but I can't do this ... no, not in that sense that it's editable by me ... that's a lie. So: that I don't like. ... I can't easily cut and paste from that, to create a class test ... which I should be able to do. I can cut and paste from the pdf, and do the formatting, but when you get to the formulae ... you can't and that's when it really matters. The website is very much better, so I'm tending to cut and paste from the web. Now I need to upgrade to Office 2010, which supports MathML and then it will all come together, that's on the agenda. So ... the adaptability I've not been happy with. ... I know there's a big project on an editor that they're working on ... and that I'm hoping they'll actually get right, ... for ordinary mortals to edit	Roger,Int1,Page:8,line:334-348
Practice	Pedagogy	adapt	vision	If I have time, I'd like to sit down and really go through and adapt ... there are certain things you can't do away with ... especially, well ... right across the FET spectrum... that's what we'll have to learn as we carry on and see where we can do it.	Reinier,Int2,Page:6,line:232-234
Practice	Pedagogy	share	vision	I can see the dream, but we are about 5 years out from that, to be able to say, here's SCHOOL A's science ... tick, tick, tick, cross, tick, lets clone this bit, and let's add in this section, I really like doing it this way, put it back, allow the people to see it, 3 days later I'm finished	Roger,Int1,Page:9,line:404-407

Community of Practice	STFLP	categories	sub category	Utterance	reference
Practice	Pedagogy	share	not shared	the ideas of Connexions are cool, I'd like to be able to use more of that, but Connexions is slow, too unsearchable, too untagged, ... to really allow me to tweak	Roger,Int1,Page:9,line:402-404
Practice	Pedagogy	share	via Siyavula	I have made it available back through Siyavula. ... FreeMind (and) Zoom-it	Roger,Int1,Page:9,line:389-391
Practice	Financial	optimal printing methods		I'm still worried about the fact that the book fell apart, because if we hand out those books, those books must come back ... and the state that they come back is important for us in order to invest in that ...	Amien,Int4,Page:2,line:50-52
Practice	Technology	internet not always available		but it would've been fabulous, especially next year they're going to bring in this whole ipad story into schools where everyone gets an ipad, but I think about the logistics behind that and I don't think we're ready yet. There will still be that 30% component that will be at a disadvantage	Amien,Int4,Page:1,line:17-20
Community	Social	Social learning	support from Siyavula	I wanted to say Mark Horner has also been to our school more than once ... we've met ... he even spoke to our learners ... last year and this year, and he has come to assist us in that way ... and we are on the Siyavula mailing lists, so if they have workshops, they let us know ... and we're welcome to attend and ask questions if we want to,	Evelyn,Int2,Page:5,line:174-177
Community	Social	Social learning	support colleagues	well your colleagues, whenever you need something. I have also assisted the others as far as I could, especially as I am head of the Maths department, especially the grade 12s, whenever they need something, you need to ... especially with supplementing as well. But as far as the e-book itself is concerned, there's no problem using it ... I mean it's straight-forward. We'll see how we progress, say looking at grades 11 and 12 next year ... Then we can see if problems have been sorted out.	Reinier,Int2,Page:5,line:168-173
Community	Social	Social learning	support from school	and we have an IT department that is also very jacked up, if that's the right word ... they assist us if they can, so if there is something I need to know I can go to them.	Evelyn,Int2,Page:5,line:177-179
Community	Social	Social learning	support from colleagues	Last year, like I said, Roger was here, and ... ja ... he knew pretty much everything about the books. So I've got most of the ideas from last year, but ...	Lindiwe,Int3,Page:4,line:123-124
Community	Social	Social learning	support external colleagues	but I think even ... Reinier and I attended a CAPS conference, like a training session, a DOE training session and we said to the teachers there, other teachers from schools that didn't have textbooks that they should use them. And I understand that there are a lot of schools without textbooks that are using them, and they're using mobile phones.	Ann,Int2,Page:5,line:182-186
Community	Social	Social learning	training required	I think just from a teacher's point of view it would be nice to have more training in terms of tips and skills, in terms of actually making ... it's such a new ... for someone who's always used hardcopy textbooks ... you don't just plunge in naturally. I naturally reach for my pen and start explaining ... one needs practise and exposure to methods of using the books more effectively	Ingrid,Int2,Page:3,line:90-94

Community of Practice	STFLP	categories	sub category	Utterance	reference
Community	Social	Social learning	support from DOE	stability, that's partly DOE, but I think they will have the ear of the DOE a little bit... They made the DOE look good. Angie Motsheka (SA's Minister of Basic Education) can stand up and say we have printed 500,000 quality textbooks, or however many they have, and if the department ... if the local district haven't got them to you, here's a ... sms this number and I will fire somebody ... or put a fire under somebody ... she can actually say that, because she, from her point of view, has actually done that. Now I think that's awesome	Roger,Int1,Page:11,line:50-506
Community	Social	Social learning	time required	Just this realisation ... if we're going to be working as a community ... that requires time where one can collaborate, and in a school ... we ... the reality is that we can't meet as a department, let alone ...in our science department, we do not have a single gap where we can meet to discuss what's happening in grades 9, 10, 11. Never mind collaboration between subjects, never mind the bigger community issue ... so ... there has to, in my mind, be a buy in, into the importance of this, in terms of making time for it, and that needs to happen.	Ingrid,Int2,Page:12,line:45-464
Community	Pedagogy	self-study		I mean I would really like ... I've got set 4 grade 11... the predictions for their average in matric will be 45%, where the average in general will be 68%. With those kids it's usually an issue where I teach and show an animation before you concretise things for them ... but with this book ... when I handed out the book ... the first day ... I handed out the book on a Friday ... the Monday ... "Wow sir, it's easy to read", "the first time I've been able to understand it" ... so it's all about ... it reaches out to those who have difficulty in understanding ... fine ... it's an easy to read book ... and also accommodates those who are sets higher than your average ... everything for everyone in that book.	Amien,Int4,Page:1,line:28-36
Community	Pedagogy	enabling revision		I've got matric ... science ... And there are times when I teach Grade 10 / 11 science in the first 20 minutes so that I can get to the new topic that I need. When we start a new topic I say to the guys, ok guys so how much ... do you remember of ... Ok right ... let's just revise this quickly and go through and where ... I've issued the Siyavula Everything Science book to them ...	Roger,Int1,Page:3,line:101-109
Community	Technology	enabling knowledge sharing		we've placed a lot of old papers on the intranet, and also the solutions are there, that's from the DOE and so on, and also textbooks, because of course you never have the perfect textbook, you're always trying to take the best ones and put together what you can, and use them as supplements ... it's always interesting to see what other options there are in the e-book that you can use.	Reinier,Int2,Page:4,line:15-161
Community	Technology	restrictions		And sometimes you have people who have their internet giving problems at home ...	Reinier,Int2,Page:2,line:59-60
Community	Financial	cost benefit		at SCHOOL A now: they delivered 2 trolleys full of textbooks. They are free,	Roger,Int1,Page:5,line:203