Evaluating an information literacy intervention for first year engineering students at the Cape Peninsula University of Technology

By

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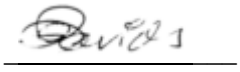
Date submitted: November 2009

DECLARATION

I, Marion Lucille Davids, declare that the thesis entitled: *Evaluating an information literacy intervention for first year engineering students at the Cape Peninsula University of Technology* is my own work and that it has not been submitted before for any other degree or assessment at any other university. The sources I have used or quoted have been indicated and acknowledged by means of complete references.

Signature: 

Date: November 2009

DEDICATION

This thesis is dedicated, in loving memory, to my late parents, Benjamin and Mary Williams as well as my nephew Kurt Connor Williams, whose encouragement, support and guidance have enabled me to fulfill my potential.

Benjamin Williams
1939 – 2004

Mary Williams
1941 – 2008

Kurt Connor Williams
1998 - 2000

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To God Almighty who makes all things possible.

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ABSTRACT

The aim of the research project is to investigate the effectiveness of an information literacy intervention for first year engineering students at the Cape Peninsula University of Technology. Information literacy has been identified as a necessary outcome of tertiary education. It refers to the life-long learning competencies of finding and using information in order to solve problems, to make decisions and to create new knowledge. Information literacy education has evolved from earlier forms of library user education, such as bibliographic instruction, and is central to the mission of academic libraries. However, librarians responsible for information literacy programmes seldom evaluate the effectiveness of their interventions. In today's climate of accountability and outcomes-based education, it is necessary to provide evidence of the benefits of the user education that libraries provide. The researcher uses the American College and Research Library (ACRL) Information Literacy Competency Standards for Higher Education, which are internationally recognized and widely used by South African academic librarians, as a benchmark to evaluate an intervention for a group of first year students enrolled for a mechanical engineering course. The intervention consists of two workshops which aim to teach the students to find information relevant to their essays via the university's OPAC, various engineering databases and to teach them how to reference and cite their sources in their essays. The research methodology assessed students' information literacy before and after the two workshops with the use of a questionnaire consisting of a set of questions based on some of the ACRL standards. The questionnaire also gathered data on students' prior experience of libraries, reading and computers, which might impact on their information literacy. The investigation found the intervention to be quite effective as shown in a marked improvement in the post-test scores. But it also identified some shortcomings: the allocated time was too short and there was no follow-up assignment to assess the longer term benefits of the intervention. The project provides insight into how information literacy education at the Cape Peninsula University of Technology (CPUT) library can be improved. Its major recommendations are that more time in the teaching timetable must be allocated to information literacy education and that lecturers must recognise the educational role of librarians.

Key words: Information literacy education, information literacy, lifelong learning, user education, academic literacy, computer literacy, communication skills, engineering technology, engineering education; training interventions, Cape Peninsula University of Technology; American College and Research Libraries Information Literacy Standards, library and faculty collaboration.

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LIST OF ACRONYMS

ACRL	Association of College and Research Libraries
ALA	American Library Association
BTECH	Baccalaureus Technologiae
CALICO	Cape Library Cooperative
CHEC	Cape Higher Education Consortium
CPUT	Cape Peninsula University of Technology
DVD	Digital Versatile Disc
ECSA	Engineering Council of South Africa
ICT	Information and Communication Technology
IL	Information Literacy
ISP	Information Search Process
LIASA	Library and Information Association of South Africa
OPAC	Online Public Access Catalogue
SAQA	South African Qualifications Authority
SCONUL	Society of College, National and University Libraries
TUT	Tswane University of Technology
UCT	University of Cape Town
UWC	University of the Western Cape
US	University of Stellenbosch

Evaluating an information literacy intervention for first year engineering students at the Cape Peninsula University of Technology

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CHAPTER 1
INTRODUCTION AND CONCEPTUAL BACKGROUND

1 Introduction

The dissertation reports on an evaluative action research project that investigates the effectiveness of an information literacy education intervention in the Engineering Faculty of the Cape Peninsula University of Technology (CPUT).

The first chapter gives a brief introduction to the topic as well as some background to the research site and the research problem. It discusses the conceptual and theoretical framework of information literacy education and provides some definitions of some key concepts. It concludes with a statement on the ethical principles of the study.

1.2 Purpose of the study

The vision of CPUT is "to be at the heart of technology and education and innovation in Africa" (2005). According to the university's mission statement, CPUT's mission is "to develop and sustain an empowering environment where, through teaching, learning, research and scholarship, our students and staff, in partnership with the community and industry, are able to create and apply knowledge that contributes to development" (2006). The vision for CPUT Libraries is to be the hub of innovative and highly valued knowledge systems, services and resources for our clients, as the information partner at the centre of CPUT's academic mission (Cape Peninsula University of Technology, 2008). CPUT Library sees itself as a key role-player in the "'empowering environment" referred to in the mission statement. And the phrase "create and apply knowledge that contributes to development" underlies the information literacy programmes run by the Library. This research study seeks to add value to the institution's vision and mission as the researcher seeks to improve her information literacy teaching.

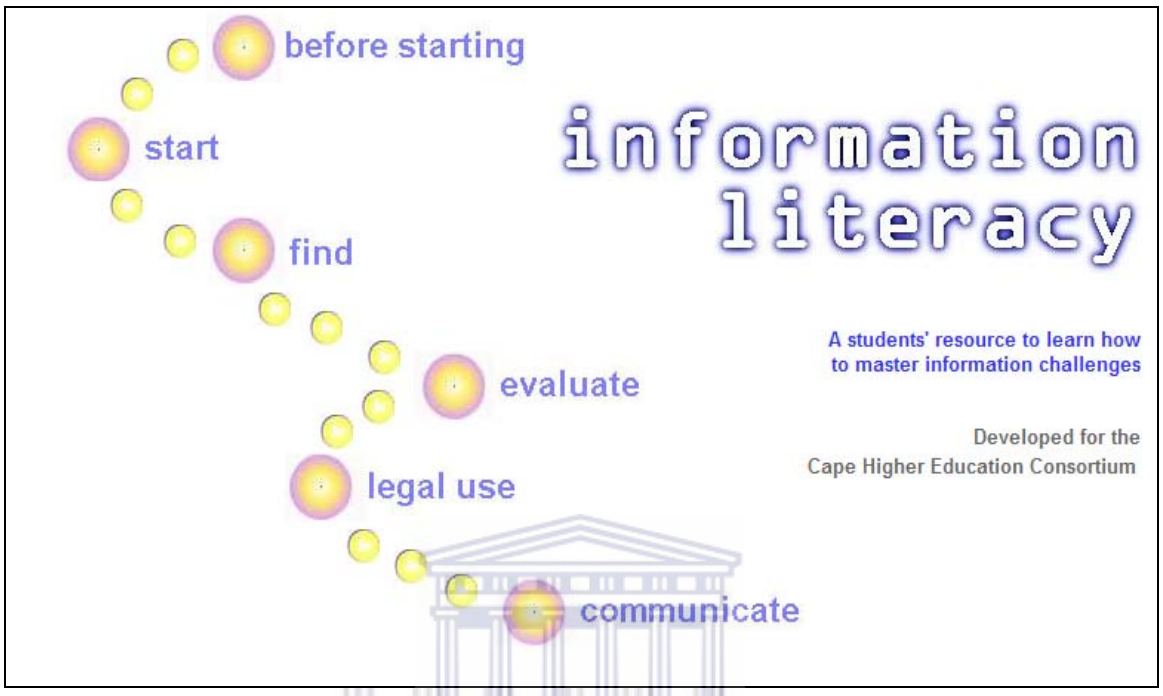
The history of the University dates back to 1920 when the foundation stone of the Longmarket Street Building of the then Cape Technical College was laid in Cape Town. In 1962 the Peninsula Technical College was established to cater for the Coloured community. In the late sixties the two institutions had their status changed to Cape- and Peninsula College for Advanced Technical Education. In 1979 both colleges were legally established as Technikons, viz. Peninsula Technikon in Bellville and Cape Technikon in Cape Town. During the apartheid era, all educational institutions were forced to serve a specific race group. In 1987 the Peninsula

Technikon opened its doors to all South Africans. In the same year, the Cape Technikon applied for and was granted special permission to have the Government's regulation lifted on the quota for black students. In 1993 the Technikons Act was promulgated, empowering technikons to offer degrees: Bachelors, Masters and Doctoral degrees in Technology. Towards the end of 2002, the Education Minister, Kader Asmal, announced that the merger between the two technikons would go ahead in January 2005. Merger offices and task teams were established during early 2003, to coordinate the process. In October 2003 the institution received its new name, Cape Peninsula University of Technology, with the changed status to university of technology. Prof L Vuyisa Mazwi-Tanga was appointed as the first Vice-chancellor of the Cape Peninsula University of Technology in February 2006. In May 2008 Dr Trevor Manuel was elected as the first Chancellor of the University (About CPUT: History, 2009).

As an Engineering Faculty Librarian at CPUT, the author's responsibility is to improve the information literacy of engineering students, so that they are better able to access meaningful information for their university assignments. Learning to find and synthesise useful information from a variety of sources, and to use it to solve problems and make decisions is crucial to their future professional lives. The Engineering Council of South Africa (ECSA) (2004: 4) provides an overview of the learning outcome for problem solving. In this learning outcome it is expected of students to demonstrate competence to identify, assess, formulate and solve convergent and divergent engineering problems creatively and innovatively.

Figure 1 depicts CPUT's information literacy model which was developed in 2001 for the Cape Higher Education Consortium (CHEC). The model follows the process approach to information literacy education that is common internationally. It sees information literacy as a process involving certain phases each with specific skills. It targets all levels of student. The course was based on a CPUT's prototype which was subsequently workshopped with librarians and academic support specialists at the University of Cape Town, the University of the Western Cape and the University of Stellenbosch. These are the member institutions of the CHEC (Lockhart and Coetzee, 2001). The Libraries of CHEC make up the consortium, Cape Library Co-operative (CALICO).

Figure 1: CPUT's information literacy model (Lockhart and Coetzee, 2001)



1.3 Conceptual framework

Information literacy is a concept that cuts across the two fields of education and information science. The South African Qualifications Authority (SAQA) lists information skills, "to collect, analyse, organise and critically evaluate information", as the fourth critical outcome of education at all levels (South African Qualifications Authority, 2008).

Since the late 1980s, information literacy has formed an important part of the literature of higher education libraries, especially in the United States and Australia and more recently in South Africa. According to Sayed (1998: 1), the notion of information literacy emerged in the 1970s with the introduction of new information technologies, which consequently signalled the need for libraries and librarians to redefine their roles. Because of the overabundance of information available in today's world, information literacy skills are needed to find relevant information from amongst irrelevant information, as and when it is needed (le Roux, 2003). Sayed defines information literacy as the lifelong ability to access sources of information, locate information and critically evaluate information:

> The term information literacy is defined by the researcher as a life-long skill enabling the user to identify and recognize the need for information, to locate, evaluate, apply and use information to communicate not only in an academic environment but also on the work front, at home and with the public on a daily basis (1998: 1).

In another definition, Sayed adds the role of information literacy in building new knowledge and in life-long learning:

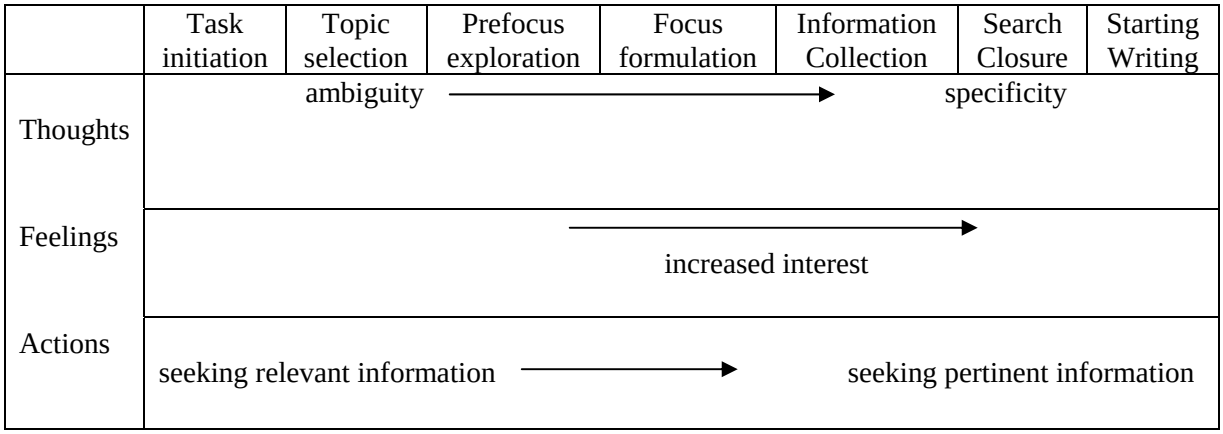
> Information literacy refers to the ability of learners to access, use and evaluate information from different sources, to enhance learning, solve problems and generate new knowledge (Sayed and De Jager, 1997: 12).

1.3.1 Kuhlthau's ISP model

Information literacy and information literacy education are concepts that have come out of the field of user studies in information science. Throughout the 1970s and 1980s, cognitive information scientists revealed the information search to be a problem-solving or sense–making process, which the information user undertakes in order to answer an uncertainty (Kuhlthau, 2004). Carole Kuhlthau's Information Search Process (ISP) model has influenced the field of information science greatly and it is the theoretical foundation for the CPUT study. Her PhD research over 14 years with school and university students shows their information-seeking as a constructive process of making meaning. Information literacy education aims to teach understanding of the process.

Figure 2 shows the ISP model's phases. Its importance for information literacy education in the library context is that it implies that user education does not involve just simply showing people how to "fetch" the right piece of information from the shelves or databases. Finding the right information depends on the seeker identifying what he or she needs and why. This requires some background knowledge. Students undertaking searches at the CPUT Library have to understand what they need. They then need to assimilate new information into their existing knowledge in order to build new meaning. Their course-work essays might provide a window on these processes.

Figure 2: Kuhlthau's Information Search Process (ISP) model (Kuhlthau, 2004)



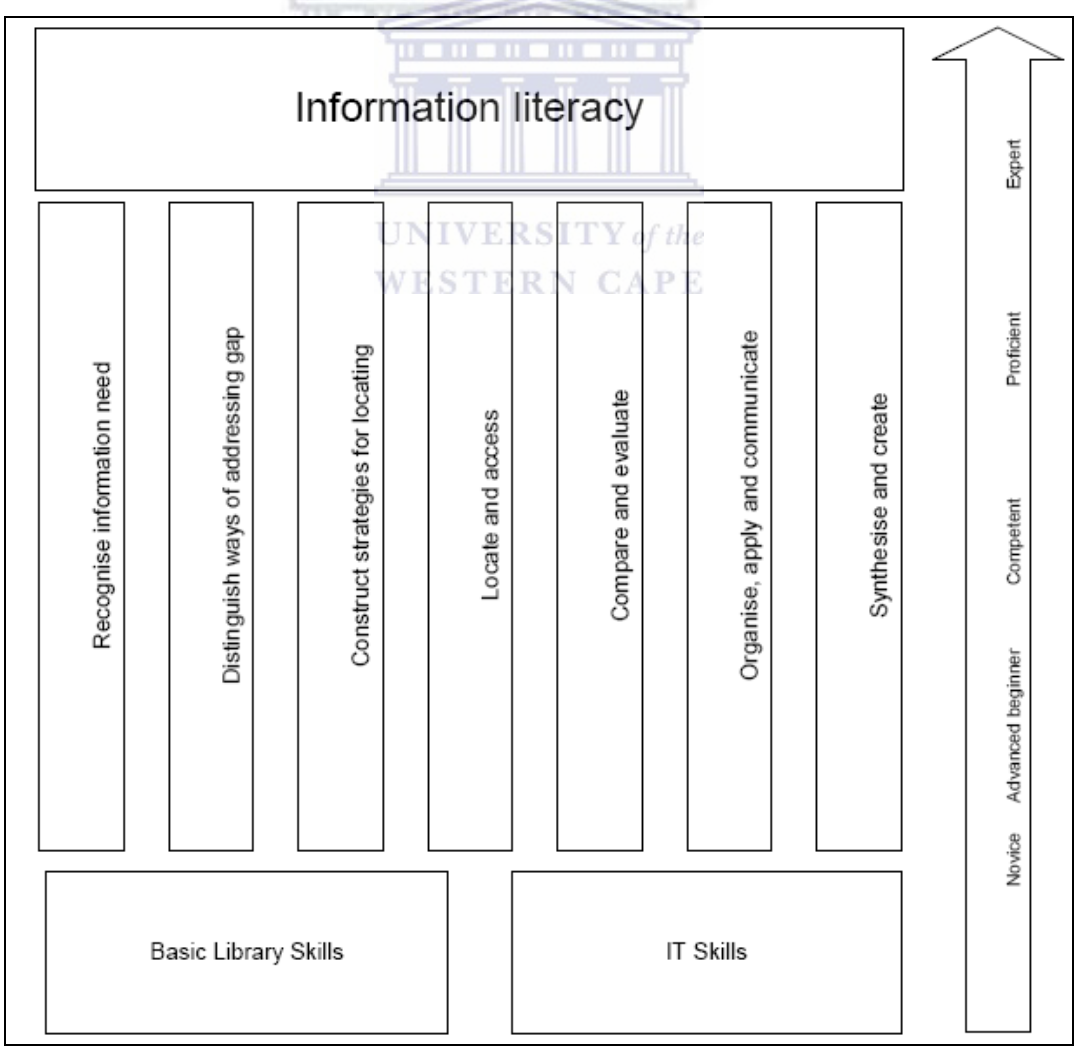
The column to the left of the diagram shows the three realms of the information seeking process: affective (feelings); the cognitive (thoughts) and the physical (actions). As information seekers go through the processes they solve problems cognitively, they undergo emotions from anxiety and uncertainty to confidence, and they choose certain strategies and actions. The diagram gives seven phases in the process. It is important to note that Kuhlthau's research shows that the phases are not linear. The first stage brings awareness of the lack of knowledge or understanding of the topic. At this point the task is merely to *recognise the need* for information. The outcome would be to discuss the topic and its approaches. Much depends on the pre-focus exploration. Once a seeker has read widely around the topic he or she is ready to form a focus which will guide the search from then on.

During the *selection stage* the task is to select the general topic to be investigated. The third stage is exploration, which is characterised by feelings of confusion. A user's thoughts would now centre on becoming oriented and sufficiently informed about the topic to form a focus or personal point of view. Users may find the situation discouraging and threatening, often causing a sense of personal inadequacy as well as frustration with the system. The *formulation stage* is when feelings of uncertainty diminish and the user's confidence level increases where students gain a sense of clarity on the topic. The *collection stage* is the information seeking process when interaction between the user and the information system functions most effectively and efficiently. The task is to gather information related to the assigned topic. With a clearer sense of direction the user can specify the need for relevant focused information to intermediaries and to systems thereby facilitating a comprehensive search of all available resources. In the *presentation stage* the user experiences a sense of satisfaction or in contrast disappointment if the search has not gone well.

1.3.2 The SCONUL model

The strength of Kuhlthau's ISP model is that it comes from empirical research and it has added theoretical depth to the field. However, there are other models for information literacy education in higher education such as the SCONUL model. The Society of College, National and University Libraries (SCONUL) has published a seven pillar model of information literacy which details the seven major information skills required by all students (1999). At the base of the model are the twin fundamental building blocks of basic library skills and basic IT skills. The model in Figure 3 is very relevant in the user education programmes of academic libraries. First year undergraduates will largely be at the bottom of the arrow, perhaps only practicing the first four skills, whilst postgraduate and research students will aim to be towards the expert end, and will be aspiring to the seventh'' (SCONUL, 1999: 8).

Figure 3: Information literacy model (SCONUL, 1999: 8)



1.3.3 ACRL information literacy competency standards for higher education

Professional associations, like the American and Australian library associations, have developed guidelines and standards for information literacy in the hope that they will be built into higher education programmes. The ACRL's Information Literacy Competency Standards for Higher Education were published in 2000 and have been widely accepted (Gullikson, 2006). The ACRL standards build on Kuhlthau's ISP model as they see information seeking and handling to be a process with interdependent phases. My intervention will adopt the framework of the ACRL standards, which propose outcomes and performance indicators, which can be adapted to the institution's needs. These indicators serve as guidelines to use for the development of the researcher's interventions as they provide competency levels to assess students' abilities. Information literacy competency is of utmost importance to students enrolled in science and engineering disciplines as they are expected to access a wide variety of information sources and formats that carry the body of knowledge in their fields. Building on the 2000 Standards, ACRL has developed five standards and twenty-five performance indicators for information literacy in science and engineering *(*ALA/ACRL/STS Task Force on Information Literacy for Science and Technology, 2006*)*. These standards assume that practising scientists and engineers should know how to keep up to date with new developments and new sources of research data.

The standards are structured in a logical hierarchy where each standard leads to several performance indicators and outcomes. A performance indicator answers the question "What do we want the student to learn?" A learning outcome answers the question: "How do we know that the student has learned?" (Association of College and Research Libraries, 2003).

The standards are briefly listed below:

- ***Standard One*****:** The information literate student determines the nature and extent of the information needed.
- ***Standard Two*****:** The information literate student accesses needed information effectively and efficiently.
- ***Standard Three*****:** The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system.
- ***Standard Four*****:** The information literate student, individually or as a member of a group, uses information effectively to accomplish a specific purpose.

- ***Standard Five*:** The information literate student understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally.

The ACRL standards selected for the project are listed in Appendix E.

There are no equivalent South African standards documents so far, although the national Library Association, LIASA, hosted a workshop in 2003 to begin the process of drawing up a South African document (De Jager, Hart and Nassimbeni, 2003).

1.4 Definitions of the key concepts

1.4.1 Information literacy

Information literacy is vital for individuals to become independent users of knowledge for their future benefit. Definitions of information literacy are widely available with variations.

Most definitions emphasise that information literacy means the ability firstly to recognise and analyse a need for information and then to access, evaluate, organize, manipulate and present information in a variety of media including electronic sources such as the Internet and online databases (Doyle, 1992; Bruce; 1994; Oklahoma State University Library, 2003; Benedictine University Library, 2006). Although information literacy is often connected to high-tech environments, in her broad survey of information literacy education for UNESCO's international summit on information literacy, Moore (2002: 5) finds that essentially it does not depend on technology. It depends on the design of learning activities, using whatever information resources are possible, in order "to promote critical interaction with and understanding of the information environment".

1.4.2 Computer literacy

According to Wikipedia, computer literacy is the ability to use computers and technology efficiently, and technology literacy is the ability of an individual, working independently and with others, to responsibly, appropriately and effectively use technology tools to access, manage, integrate, evaluate and create and communicate information. This definition is close to common definitions of information literacy.

However, a computer literate person is not automatically an information literate individual as the latter requires cognitive skills and problem-solving processes (King, 2007: 8). Both the

University of the Witwatersrand (2007) and Maidique (2006) at the Florida International University argue that computer literacy should be a prerequisite for information literacy. Information literacy is more than computer literacy and more than library instruction.

1.4.3 Information literacy education

The library's aim is to encourage users to become competent and independent information seekers. Information literacy education is the medium where students are trained to become information specialists and information seekers. The library provides the environment and training required to source scholarly articles to introduce instruction of this nature to users. It is the intent of an information literacy education programme to equip students with the necessary crucial information- and academic skills to ensure life-long learning is edified. Hart (2005: 23) notes that the term "information literacy education" over "information skills instruction" indicates a belief that information literacy is not a set of skills that can be taught mechanistically. The Durban Institute of Technology (2005: 1-4) adopted a user assistance and information literacy education as the key functions of the library's information services to support their academic programme where they put great emphasis on the empowerment of library patrons. Bruce, Edwards and Lupton (2006) provide a six frame method of introducing students to the information literacy education process tool for analysing, interpreting and understanding challenges and how information literacy should be approached.

Haberle (2001: 49-50) notes that information literacy interventions cover both the lower and higher order skills as originally outlined in ''Bloom's Taxonomy of Educational Objectives'' which requires that students first master the cognitive skills of the lower level of each knowledge domain before the higher order skills may be mastered This taxonomy is categorized and further developed for the analysis of library and information skills by making provision for the progression from lower order to higher order skill in three graduated steps: from orientation to interaction to internalization. *Orientation*: to recognize a need for information and to familiarize oneself with the library and its resources. The *interaction stage* requires of students to perform a search in the library to satisfy an information need and when users have progressed to the internalisation level, they should be able to use the library on a continuous basis to fulfil information needs in all aspects of their life, thus becoming daily, life-long information consumers that most closely matches the characteristics of information literacy. *Internalisation* means to be able to compare and evaluate information from different resources; to be able to organise, use and communicate information; to produce and present an organized piece of work

and to synthesise and build new knowledge based upon existing information (Haberle: 2001: 56, 58).

1.5 Research problem

The researcher's experience as a faculty librarian for eight years has convinced her of the need for effective information literacy interventions. High first year failure rates at her institution indicate that first year students are not able to cope with the demands of tertiary study. Information literacy is a vital set of skills to be taught to students, for their degree studies and for their future careers. Internationally and in South Africa, there is agreement that information literacy must be an outcome of tertiary education and that information literacy education is part of the mission of academic libraries.

The research problem is to investigate the effectiveness of the researcher's existing information literacy teaching, with a view to identifying its weaknesses and strengths and to make recommendations to the Library and to the Engineering Faculty. The ACRL Information Literacy Competency Standards, it is hoped, might provide an objective evaluation tool for the researcher to assess the effectiveness of her course.

This problem statement and the reading of the conceptual and research literature led to certain research questions that will be spelled out in Chapter 3, where the study's methodology is explained.

1.6 Ethics statement

The research was carried out by following the ethical principles and procedures as recommended by the University of the Western Cape and the Cape Peninsula University of Technology.

The lecturers responsible for the first year course approved my project and agreed to allow me access to their classes. The student participants in my study were fully informed of the project. Their participation was voluntary and they were informed of their right to withdraw at any time. All responses were treated with the utmost confidentiality and students remained anonymous. The research was conducted for academic purposes solely and the data gathered had no bearing on the students' academic results.

1.7 Chapter outline

The dissertation is structured as follows:

- Chapter 1 introduces the topic and gives some background. It describes the research problem and states the ethical principles of the study.
- Chapter 2 provides a review of research in information literacy education with an emphasis on engineering and South African studies.
- Chapter 3 returns to the research problem and gives the research questions that come from the problem. It explains the research approach, evaluative and action research, and describes the data gathering methodology and the reasons why the methodology was considered to be appropriate for gathering the data required to answer the research questions.
- Chapter 4 summarises and analyses the data gathered during the pre- and post-intervention test questionnaires.
- Chapter 5 attempts to answer the research questions by interpreting the findings from the analysis of data.
- Chapter 6 briefly reflects on the project and concludes the dissertation with some recommendations for the researcher's practice and for her library.

CHAPTER 2
RESEARCH IN INFORMATION LITERACY EDUCATION

2.1 Introduction

Chapter 1 has introduced the project and provided the theoretical frame for information literacy education in higher education and specifically in engineering education. This chapter reviews some of the international and South African research in information literacy education at higher education institutions from 1997 onwards. The literature has two main themes: assessment of the information literacy of university students and lecturing staff and assessment of libraries' information literacy education programmes. The Chapter is organised into the following sections:

- studies in engineering education;
- studies in South Africa, not specific to engineering;
- common themes and issues in information literacy education research in higher education.

2.2 Information literacy education research

This section's focus is on international research in information literacy programmes in engineering education.

Leckie and Fullerton (1999) conducted a questionnaire survey of the engineering and science teaching staff at the University of Waterloo and the University of Western Ontario in Canada. They view information literacy as an essential component in higher education which should be embedded in all types of scholarly work. However, they admit that course integrated library instruction can be time-consuming for librarians and faculty. Lecturers were surveyed and interviewed regarding their perceptions of their students' information literacy skills and their pedagogical practices related to information skills. The study also investigated the faculty awareness of the role of the science and engineering librarians in information literacy instruction. The survey found that the undergraduate students had poor information literacy skills but that this improved in the upper years. Leckie and Fullerton (1999: 10) found that students, who had not learnt to do library-based research when they reached higher academic levels, were unmotivated, uninterested or just poor students. The majority of the faculty members thought that library instruction was not necessary even though 41% of respondents indicated that some or all of their courses in the first and second years required library research. The follow-up personal interviews

with the faculty also revealed that a great portion of the faculty admitted they have a poor understanding of how students learn to do library-based research. The study questions whether librarians are receiving adequate support from faculty staff. They doubt if academics are aware of how academic librarians can help to instil information and critical thinking skills in students.

Feldmann and Feldmann's study at Drexel University in the United States in 2000 focused on students rather than faculty. A project was designed to increase students' information search skills, their awareness of sources of technical information and their communication and team-building skills. The authors developed a project that integrated information search and communication skills into a design process course. The entire first year engineering class comprising 700 students participate in the course annually. The basic skills were introduced in a freshman Materials Course and were refined and further focused in a Strength of Materials course (2000: 2). The authors presented a detailed information literacy lecture where students were introduced to the online catalogue, journal indexes and the use of the Internet for research. The methodology was questionnaires where a pre-intervention test was administered to establish a baseline of library usage and knowledge of the resources available. A post-test was administered after the project to determine the improvements and students' attitudes toward the assignment. The written reports were evaluated and assessed by the professor and the librarian and graded for quality of research, variety and appropriateness of selected resources such as books, articles, internet sites. Their study found that many of the students had never used libraries or the Internet to locate technical information or were even aware that they could do so. The majority of students did not know how to use an online catalogue, had never heard of journal indexes, and found Internet searching to be difficult and often unrewarding. The quality of the final product was much better in subsequent semesters and the quality of the oral presentation also improved (Feldmann and Feldmann 2000: 3).

A later Canadian study also focused on students' skills. The objectives of this 2003 study, as outlined by Mittermeyer and Quirion (2003), were to compile data on the information skills of undergraduate students entering Quebec University. The research used the ACRL standards as its theoretical framework. Data gathering was conducted by means of questionnaires outlining 5 themes of 20 questions (2003: 5). The themes included concept identification, search strategy, document types, search tools and the use of retrieved results (bibliographic referencing, citing and the ethical use of information). Their research found that many students appeared to misunderstand or were totally unaware of the basic elements of library research. Students' lack of

awareness of the research process had a negative impact on students' abilities to search and retrieve the information needed to complete assignments. Students who did not understand the effectiveness of the various types of documents and the different search tools were wasting time searching by trial and error.

Roberts and Bhatt's documents an information literacy teaching and learning experience in the School of Engineering at the University of Western Sydney, in Australia. It evaluates and reflects upon how effective it was at helping students navigate their first tertiary level research tasks. "The ability to access, evaluate and synthesise high-quality research material is the backbone of critical thinking in academic and professional contexts for engineers and industrial designers". This is the principle upon which teaching and library staff developed information literacy components in Engineering and Industrial Design Practice - a first-year unit of study. The project provides an introduction to library and information literacy skills, such as defining an information need, locating and evaluating information resources and ethically using resources in written papers and reports. The skills are covered in the classroom and in peer tutoring sessions. Roberts and Bhatt (2007: 243) state that engineering librarians have the primary responsibility of providing access to engineering information resources and giving instruction on how to use these resources. The success of the course resulted in a new revised engineering curriculum.

It seems that research indicates that a successful information literacy programme must be introduced early in the student's university education and be reinforced often, with assignments of increasing complexity. The Civil and Environmental Engineering Department at Villanova University in Philadelphia, is an example of a programme that takes this into account. The Department developed instructional modules for use in the Department of Civil and Environmental Engineering (CEE) to help students become information literate. The six modules, which are placed throughout the students' time in the department, were developed to build upon one another and are discipline/course integrated (Welker, Quintiliano and Green: 2005).

2.3 South African research in information literacy education in higher education

There is a fair amount of South African research. This research selected for this section has lessons for the author's CPUT project.

In 1997, Ruth explored the student experience of the Library of the University of the Western Cape (UWC). Her motivation was concern that efforts by library staff and academics to equip students to use the library seemed to have faltered. She used questionnaires to gather information

on the use of the library by students. She found that students did not look for information; rather they looked for books, or a paper, or a photocopy. Ruth contends that lecturers perpetuate, through reserved and/or prescribed texts and articles and their use of the Shortloan facility, the belief that only those sources contain the required set of facts needed to pass the course. This creates the perception that the library is a warehouse or storage place for books. Ruth concludes that many of the problems experienced in the library by students originate elsewhere, such as in general study conditions, design of assignments and curricula content. Students at schools are taught to be text- and teacher-centred rote learners, but university education for the 21st century should demand, she claims, a fundamentally different approach to learning (Ruth, 1997).

In 1998, CALICO, the Western Cape higher education library consortium, undertook a study of the information literacy needs of students in the CALICO universities, CPUT, University of Cape Town (UCT), University of Stellenbosch (US) and University of the Western Cape (UWC) (Sayed, 1999). Questionnaires were distributed to a sample of students. Then it made use of two sets of focus group interviews with groups of librarians and librarian educators. One was to understand the notion of information literacy and information literacy programmes at the four universities; and the other discussed the first round findings obtained from the questionnaires regarding students' information literacy abilities and needs. Sayed notes that using information demands ''higher-order cognitive skills'', as the critical evaluation and manipulation of information enable students to generate new ideas and contribute to the development of new knowledge and ideas (1998: 13). An important part of the study was to ascertain the competence of students in respect of three areas of information literacy, specifically reading and writing ability, library usage and computer competence. The results indicate that students at historically disadvantaged institutions have less access to computers and such facilities than their counterparts such as the historically advantaged institutions. This confirms the differences between the resources available in historically disadvantaged institutions compared to historically advantaged institutions. The study found significant differences between the information literacy of students from the historically advantaged or white campuses and those from the University of the Western Cape and the Peninsula Technikon, whose students probably would not have had the same experience of libraries and other information sources in their schools. The research project led to an information literacy unit, Infolit, which set out to build information literacy programmes across the CALICO members.

Erasmus (2001: 16 - 18) reports on Technikon SA Library's challenges in developing an information literacy programme that would benefit students with vastly different backgrounds and level of skills. Provision had to be made for students lacking library skills and those familiar with the library and eager to use information technology. In this scenario the larger group was the group lacking library skills and the library's priority was to develop material and implement programmes to support their academic development. Cooperation with academic departments and support from top management was required. Her study reveals that many students entering higher education institutions are unprepared with regard to information skills as a result of various factors such as shortcomings in primary and secondary schooling systems. She also found that students do not do independent study as they expect relevant facts to be provided by lecturers and librarians. Erasmus confirms that the major proportion of the Technikon SA student population has a proven need for basic information handling skills.

From the late 1990s, all South African higher education institutions were engaged in curriculum reform to bring their academic programmes in line with the National Qualifications Framework (NRF) of the South African Qualifications Authority (SAQA). SAQA had adopted a number of cross-field critical outcomes which are reflected in the National Qualifications Framework and which include information literacy. Responding to these developments, in 2002 De Jager and Nassimbeni investigated information literacy instruction at university libraries across South Africa. An electronic questionnaire was designed and emailed to 26 higher education institutions in South Africa to assess the extent of institutional support for information literacy and to record practices Only 12 libraries responded however. The study was followed by a second, follow-up questionnaire. The findings from the second questionnaire found that information professionals should lobby for institutional support for information literacy at the highest level in their institutions. The issue of generic courses as opposed to courses integrated into the curriculum was considered in both surveys, with arguments for both put forward. The survey echoed the CALICO finding around the discrepancies between students from historically black disadvantaged universities and historically white advantaged universities. The respondents reported that the majority of entrants into South African tertiary institutions lack information literacy skills. As the authors say, ''Students bring to higher education a set of previous experiences, beliefs and disciplinary traditions that may either hinder or enhance their learning and these should be taken into consideration in activities aimed at developing information literacy in students'' (De Jager and Nassimbeni, 2003: 114). De Jager and Nassimbeni's survey was meant to lead to benchmarks

that could guide librarians and teachers toward the best practices for ‘‘inculcating information literacy’’ in the extremely diverse South African student body.

The aim of Somi and De Jager’s study of information literacy education at Fort Hare University (2005: 259 – 267) was to investigate the extent to which the University of Fort Hare Library promotes and enhances information literacy. The instrument used was questionnaires completed by both undergraduate and postgraduate students about their experiences in the library and their use of library materials. The survey was conducted to ascertain whether the Fort Hare Library was successfully providing students with the information skills for their academic work. The report emphasizes the difficulties students face as new technology makes information available mainly in electronic formats. The authors highlight that, while there is some evidence that the University of Fort Hare Library is engaging in information literacy activities, students still have difficulty in finding, critically evaluating and using information. The authors draw attention to the task of academic librarians to equip students with the necessary information skills to function effectively and to meet the challenges of the information age. General orientation as well as subject specific orientation is provided to students. At the end of the training session, students are meant to be able to use information resources, use the library’s homepage, evaluate online resources, find resources by using the databases, write assignments, use correct citation styles and be familiar with the library rules and regulations. Whilst the library is striving to equip students with life-long skills, an additional three month computer literacy training course is offered in the evening at Fort Hare’s Computer Centre at an additional cost of R1500. Due to extra payment involved and because the course is not integrated into the curriculum only a few students are able to attend. Students, who are unable to afford the course, lack the necessary computer literacy skills (Somi and De Jager, 2005: 261).

Orientation is offered to all new students that enrol at the University for the first time and is intended to help close the gap between high school and tertiary education. Although the library orientation is compulsory and is offered during the first week of the term, the majority of respondents did not attend the library orientation. Late admissions who missed the orientation session also cause problems. The orientation session covers photocopying, library rules and regulations, reference materials, the OPAC and journals. Somi and De Jager (2005: 262), however, found that the orientation had not necessarily enhanced students’ information literacy. Respondents were asked to indicate the one source of information that they consult first when given an assignment. The study found that 36% of respondents consulted open shelf books as

their first consulted source whereas 28% choose the Internet as the preferred preference of information seeking as their first choice, while 12% consulted with the faculty librarian first. It was also found that the OPAC is not user-friendly, especially for first time users. Respondents were familiar with surfing the Internet and source most of their information for academic assignments via the Internet.

King's PhD research (2007) over three years in the Arts Faculty of the University of the Western Cape (UWC), next door to CPUT, had two objectives: to assess the information literacy of incoming first year students and to assess the impact of Library Science 121, a credit-bearing information literacy module for the Arts and Education Faculties, run by UWC's Department of Library and Information Science. For three years running, she administered a pre-test before the course began, which indicated that the baseline information literacy level of an average incoming undergraduate Arts student ranges from low to very low. She found that, prior to entering the university, the average Arts student is not computer literate, has limited access to computers, does not use e-mail, does not use the Internet as an information resource, is not a dedicated library user, is not library literate and is not a keen reader for pleasure or for research assignments. After the completion of the course, the students wrote the same test. The comparison of pre- and post - tests indicated that the Library Science 121 course impacts positively on information literacy scores. A control group of students, who did not do Library Science 121, also wrote the tests. Comparison indicated that students who did not enroll for the information literacy course had lower information literacy scores. King claims that her results show that not all Arts students pick up information skills during academic courses or by attending the information literacy initiatives offered by the academic library at UWC. She notes that it is an indication that formal information literacy education is essential for incoming Arts students at the UWC. The results were used to identify the deficiencies in information literacy levels, to produce benchmarks for assessing information literacy at the university and to produce a theoretical framework for structured cumulative information literacy initiatives within the new envisaged foundation level programmes.

King notes that not all first year students attend Library Science 121. She claims that her research shows the need for a generic compulsory course, where basic skills are mastered to ensure that all students are on an even level of competency and to enable librarians to render an effective subject based information service. The aim as outlined by King is to develop the current credit-bearing stand-alone course into a compulsory information literacy course that all students will benefit

from (2007: 78). However, the lack of support from the Faculty and academic development staff makes it difficult to find a place for such a course within the academic structures.

Stoffberg and Blignaut's report (2008) on information literacy programmes at Tswane University of Technology (TUT) is useful as, like CPUT, TUT comes from a merger of historically disadvantaged and advantaged institutions. After the merger of the three Technikons (Technikon Pretoria, Technikon Northern Gauteng and Technikon North-West), the university re-looked at the information literacy programmes and implemented a new approach that targets both the "technology-enabled" generation as well as previously disadvantaged student communities. Stoffberg and Blignaut analysed and evaluated Tswane University's generic information literacy programme. They found that students and staff are not fully trained to use the new sophisticated electronic research tools. The University's information literacy programme is presented on campus only and is not web enabled. Tswane University uses the Australian and New Zealand information literacy framework standards (implemented according to the specifications of SAQA).

At TUT the information literacy programme instructors are faced and confronted with unexpected factors such as larger classes, leading to insufficient library staff to meet the training demand, and inadequate training facilities such as appropriately equipped lecture theatres and computer training rooms (Stoffberg and Blignaut, 2008: 1-4). An information literacy programme demands ICT training facilities such as data projectors, DVD players, headphones and interactive classroom-management systems. Training sessions at TUT are scheduled according to the time table of the user group under the guidance of the training librarian in collaboration with the faculty but the Institution makes no provision on students' time tables for students to attend information literacy training programmes. Students rely on their lecturers to arrange, initiate and schedule training sessions with the training librarian. Only on-campus students can attend the training. As information literacy training is not compulsory, many students never attain these skills. Some students require basic computer literacy instruction and these students are referred to a computer literacy training programme before starting the information literacy programme. There are also the ''Y'' and ''Z'', computer, Internet generation who might be technologically savvy but still lack the skills to perform basic academic research. To enhance their learning experience Stoffberg and Blignaut have added an online guide (2008: 6).

2.4 Key issues for information literacy education

The review of research reveals certain key issues for information literacy education. These are:

- the need for collaboration between librarians and faculty
- challenges in assessing information literacy
- the underpreparedness of students for university education
- the impact of ICT.

2.4.1 The need for librarian and faculty collaboration

Information literacy is largely seen as the responsibility of librarians as they teach and communicate information literacy skills to users. But, as pointed out in Chapter 1, an integrated approach is the most effective route to success. Information literacy skills have to be learned and practised as students undertake their "real" work. McGuinness: (2006: 573) talks of "targeted collaboration" between librarians and key university constituents.

However, not enough librarians are qualified as subject specialists and are therefore perhaps not knowledgeable about how information is organised in specific disciplines (Thompson and Cronjé, 2001: 8). Young (2008: 139) affirms the importance of collaborative agreements between librarian and the faculty to face the challenging and new role to become academic advisors. Terrell (2004) notes the roles of the stakeholders should be clearly identified to create a clear vision of the tasks that should be executed during an intervention. For example, who will cover the ethics of research, the library or the faculty?

Hume (2001: 91) declares, to overcome educational barriers and to make the information literacy learning process a success, students need support systems that will help them to become successful. Information literacy education alleviates students' fears as they are faced with a vast array of information resources. Yet it seems that the attitudes of many academics towards information literacy education hinder collaboration. Weetman (2005) indicates that some academics feel that students should already have acquired information literacy skills prior to entering an academic institution. However, the previous section has described research that shows that students in fact lack these skills. In South Africa most students enter the institution without having been exposed to libraries, computers or information literacy education. Research further shows that most undergraduate students source their information by using the Internet which means that it is possible for science and engineering undergraduates to avoid the library, at least until relatively late in their educational experience. Somi and De Jager (2005: 259) assert that

much of the information sourced by students from the World Wide Web (www) comes unfiltered by peer review and this raises questions about authenticity, validity and reliability.

Both King's and Stoffberg and Blignaut's studies (2007; 2008), which were described in the previous section, comment on the issue of collaboration. King describes some collaboration between faculty and library in the planning of the information literacy course, Library Science 121. Librarians helped design some tutorials and they act as tutors. Academics across the Arts Faculty were invited to supply topics for the assignments. But King warns that, unless teaching staff and administrators at her university build compulsory information literacy education into the timetable, their students will continue to lack the information skills they need for academic work.

Stoffberg and Blignaut describe a module which they see as a model of collaboration between the training librarian and the continuing education unit. A three-hour intervention session is presented to groups of 20 to 30 students, in a computer training room with access to the institution's electronic resources. The session has six parts: introduction to the library and its services, locating information on the library's electronic resources, accessing, retrieving, evaluating and applying scholarly information and the use of the Harvard Citation Referencing method.

The University of Stellenbosh Library overcame obstacles by working in collaboration with the "faculty, programme coordinators, and consultations with academic staff to identify certain modules within a programme in which information literacy receives special attention" (Steyn and Maritz, 2003). To execute the information literacy learning process, the library identified the following role players: the students who have the responsibility of learning the necessary skills; the academic staff who have the responsibility of facilitating the learning process and the subject librarians to assist the academics in the teaching process. It is also the responsibility of the academic staff to inform their students of the outcomes and assessment criteria regarding information literacy. Subject librarians make provision in their annual programme to present seminars, workshops and discussion sessions. With faculty collaboration the subject librarians provide guidance to students by: teaching students how to identify relevant and valuable primary and secondary sources of information; developing successful search strategies; respecting copyright; evaluating critically the reliability and suitability of sources of information; and using acceptable conventions with regard to the referencing of primary and secondary sources (Steyn and Maritz, 2003).

2.4.2 Information literacy assessment

There is debate in the information literacy literature on how to assess information literacy and information literacy education programmes. The outcomes of libraries' traditional user education were rarely assessed. Students would be sent to the library for orientation workshops for example, but their learning would not be measured. Robinson and Davidson (2004: 77) define assessment as "the act of judging the quality of something, especially pupils' or students' work." Powis and Webb's textbook on information literacy education (2004) finds the most common assessment methods to be:

- Students' bibliographic citations (quantity and quality)
- Student portfolios
- Student journals and ''think-aloud'' interviews
- Focus interviews with students
- Qualitative and quantitative assessment of student handling of information scenarios and case studies. *What would you do if …?*
- Quantitative measurement of students' knowledge and competence (e.g. tests of course content retention)
- Measurement/logging and/or observation of students' search techniques (of the Web, OPAC, databases, etc).

There are pros and cons to each method. For example, many are too time-consuming.

Academics and librarians should work together to develop assessment instruments and strategies (Council of Australian University Librarians, 2001). The ACRL standards, which were described in Chapter 1, provide benchmarks to assess information literacy. According to the ACRL (2000), an assessment programme should be designed by both academics and librarians, should pinpoint areas for further development, and build on learning goals already achieved. Assessment methods appropriate to the thinking skills associated with each outcome should be identified. The five standards are presented with performance indicators, which serve as guidelines for academics and librarians for measuring student learning.

The major challenge for libraries' programmes is that they are not often credit bearing or mandatory. So assessment in their voluntary courses is often not taken seriously. As King (2007: 77) points out, students do not go voluntarily for training sessions offered by the academic library and students do not devote time to activities which do not count towards their official assessment.

Responses provided in De Jager and Nassimbeni's survey (2003: 108-114) of practices in South African universities present evidence of awareness of the need for assessment in information literacy courses. In the initial investigation, seven institutions reported offering fully assessed courses, three reported some assessment and two none. Credit-bearing courses were fully assessed by means of assignments, tests, portfolios or examinations; otherwise questionnaires or course evaluation forms were used. There is an agreement amongst higher education institutions that assessment is required after information literacy training interventions.

Obberprieler, Masters and Gibbs (2005: 596) describe how their intensive 15 hour course at the University of Cape Town is evaluated after four months to judge the degree of skills improvement. Students are requested to evaluate the course by completing an online evaluation form. They are expected to rate the value of the course and the improvement in their skills. All assignments for the multi-professional foundation course require students to adhere to specific formatting and referencing guidelines, where a score is assigned. Oberprieler, Masters and Gibbs (2005: 596) provide ongoing training interventions after the pre- test interventions, within small groups, which are integrated into their first year of study.

The outcomes and assessment criteria at Tswane University of Technology (TUT) form part of the informal assessment of the programme and a no-credit test follows the programme. Students are required to identify a suitable database to retrieve specific information, create search statements, access specific databases, execute and refine searches, select and mark appropriate articles and export them via email (Stoffberg and Blignaut, 2008: 7).

2.4.3 Underpreparedness of students

As mentioned before, universities are faced with underpreparedness of students for tertiary education. Many of the challenges come from school leavers' weak literacy. As Sayed points out, reading to decode the meaning of a text is an essential component of information literacy (1998: 9). Thompson and Cronjé (2001: 8) agree on the links of language skills to information literacy, stating that "linguistic competence is a significant characteristic of an information literate person. One of the problems faced by many students is a lack of linguistic competence, which handicaps them severely in using information effectively''. In South Africa many students, says Hugo (2003: 48), do not become literate at school and struggle with basic literacy at tertiary level. A large number lack the ability to perform academically as their skill is not in line with the academic demands of tertiary studies. At university, readers should know how to

critically analyse text so that they are able to form their own perception and critically examine the text and apply own concept or idea.

The University of Pretoria found that, out of 6000 students, 2000 students had an English language ability which was on the level of a Grade 7 learner or even lower. Students with a home language of either English or Afrikaans also had poorly developed reading and writing abilities (Rademeyer, 2001: 1). Hugo (2003: 48) reports that the University of Free State has identified similar problems. One study found that in a test of the reading levels of 60 first year students, not one of the students' reading levels was higher than the reading level of a Grade 8 learner. Yet, they are required to have English language proficiency which would allow them to read relevant academic content at university level (Hugo, 2003: 48).

The University of the Free State has established a framework to address the inequalities of poor reading and writing skills amongst students. English is the medium of instruction at the University. A one year bridging English language course was designed for underprepared students and for students where English is a second or third language. The course aims to address low language proficiency as well as the communicative needs such as academic literacy. The reading component of the course includes extensive reading and vocabulary development whereas the writing component aims to develop students' sentence control, clarity of expression, organisation and awareness of audience (Van Wyk: 2002: 220). Students entering the university with a matric symbol of either a D or E are encouraged to enroll for the English language course to give them a fair chance of success at the university. Extensive reading brings a number of benefits such as, ''improving reading fluency, enlarge students vocabulary, increases background knowledge, and improves students' ability to process sentences quickly and accurately and provides a positive attitude towards reading'' (Van Wyk, 2002: 224).

2.4.4 ICT issues

All agree that computer literacy is an important component in information literacy education. The move from print to electronic resources is common amongst libraries in South Africa and especially amongst the CALICO institutions, where all have implemented and made available electronic journals and electronic books, with institutional repositories, already in place or almost implemented. All CALICO users can surf their institution's website remotely finding electronic content at their own leisure. This change calls for computer literate users to be able to navigate the institutions' resources successfully. The electronic environment demands specific user skills.

Students will have to be trained critically to analyse information which they obtain from the electronic resources or the Internet. Hugo (2003: 48-49) notes that African students do not have access to technological forms of literacies when they start their tertiary education. Higher education institutions should therefore make provision for the training of students in this respect by implementing bridging courses. In South Africa, computer literacy instruction at school level is not the norm. ‘’The spectrum of skills of incoming first year students at South African universities ranges from a high degree of proficiency to complete novices’’ note Oberprieler, Masters and Gibbs (2005: 596). Furthermore, they observe that students require computer skills at various stages of the first year curriculum and that students with no prior exposure to computers start the first year with a need of basic understanding of the functioning of a computer and basic skills in Windows, file management, word processing and the use of the university’s ICT facilities.

Radia and Stapleton (2007: 9-17) explored the usage of the Internet and its impact on the writing process and on the quality of students’ academic papers. They note that it was people in the library sciences who first expressed concern at the poor quality of sources used in academic writing. They found that students prefer and submit assignments with web citations rather than credible citations from academic papers. It is so easy to download website information. It seems that undergraduate students of all disciplines need to be taught the difference between Google searching and credible database searching.

Academic dishonesty includes cheating and plagiarism, the theft of ideas and other forms of intellectual property, whether published or not. Plagiarism is theft of intellectual property belonging to another. Jones (2001: 4) defines plagiarism as the use of such material without any attribution, citation, and acknowledgement or quotation marks. This includes both the theft of unwritten ideas and concepts as well as the theft of written texts, notes, computer programmes, designs and visual materials. Academic dishonesty can jeopardise future career paths of students. At CPUT, all types of academic dishonesty, such as cheating, fabrication and plagiarism are subject to disciplinary action which could lead to suspension or expulsion from the university. However, De Jager and Nassimbeni point out it cannot be assumed that students understand the concept of plagiarism. They need to be taught:

- to quote and cite others’ work correctly;
- to know about issues such as copyright and plagiarism;
- to know about issues such as currency, bias and authority (2003: 110).

Even though students in their study showed that the Internet was their first choice of sourcing information, Somi and De Jager (2005: 262) established that students lack the ability to evaluate Internet sources for credibility and authority. And 52% of their respondents admitted that they do not know how to cite Internet sources.

2.5 Conclusion

Over the years the job of a librarian has changed to that of an educator. Higher education institutions have changed and adapted their information literacy educational programmes. By 2008, information literacy programmes are offered either as stand-alone generic courses or courses integrated into the curriculum. The literature indicates that librarians and faculty are collaborating more with each other.

The literature review indicates that first year university students in South Africa lack academic literacy, computer literacy as well as reading and writing literacy. Entry level students do not have the necessary skills to perform database searches – a basic demand of library use these days. So librarians continue to advocate information literacy interventions. Skill in accessing, manipulating, and evaluating information sources, print and electronic, is necessary for student success in higher education and the corporate world. An information literate student should be able to assess the value of information by assessing the difference between peer-reviewed versus popular information and effectively use it within ethical and legal boundaries of the plagiarism and copyright acts.

Three projects, discussed in this chapter, are of special value to the CPUT study: the CALICO study of information literacy at the universities in the Western Cape (Sayed, 1999); De Jager and Nassimbeni's survey of information literacy instruction across a number of South African universities (2003); and King's PhD study of Arts Faculty students at the University of the Western Cape, a close neighbour of CPUT (2007).

CHAPTER 3
RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter returns to the research problem, which was discussed in Chapter 1, to identify key research questions. It then explains the research design and methodology and the reasons why the methodology was considered to be appropriate for gathering the data required to answer the research questions.

3.2 Action and evaluative research

This study uses the ACRL Information literacy standards as its theoretical framework and was implemented to determine information literacy skills of first year Mechanical Engineering, Electrotechnology 1 students at CPUT and to assess an intervention by the library. The project is both action research and evaluative research. Powell (1997: 45) claims that action research is a major type of applied research and indicates the similarities between action research and evaluative research. The CPUT study examines the researcher's own practices and evaluates an intervention by means of pre- and post-intervention testing. The researcher investigated her own practice in a naturalistic setting. According to Powell, action research is "to develop new skills or new approaches and to solve problems with direct application to the classroom or other setting". He also describes it as "practical, orderly, flexible, adaptive, and empirical to a degree" (Powell, 1997: 45).

Powell describes the purpose of action research as "to develop new skills or new approaches and to solve problems with direct application to the classroom or other setting" (1997: 45). He quotes Isaac and Michael's identification of the basic steps in action research as follows:

- Defining the problem
- Reviewing the literature
- Formulating testable hypotheses or questions
- Arranging the research setting
- Establishing the measurement techniques and evaluation criteria
- Analysing the data and evaluating the results (Isaac and Michael in Powell, 1997: 45).

The researcher chose this type of research as her study is based on developing new skills and approaches and solving real problems. Action research is a process involving cycles of action

which are based on reflection, evidence, feedback and evaluation of previous actions and the current practice. Data are gathered and this directs future decisions / action (Robertson, 2005 as cited in Wilson, 2006). Action research is often done in teams or by a "community of practice" to improve the way they address issues and solve problems in workplace environments (Wilson 2006). Denzin and Lincoln (2005: 559) define action research as a mix of participatory research, classroom action research and action learning. Action research involves the investigation of actual practices and not abstract practices (Denzin and Lincoln, 2005: 563-564). Action research is an ongoing process and the main focus of action research is to bring about change.

Evaluative research is applied research and is based on the testing of the application of knowledge within a specific program or project. In most evaluative hypotheses the dependent variable is a desired value, goal or effect (for example, better library skills). Evaluative research provides useful feedback to stakeholders. The relationship between an evaluation and its impact is not simple. Studies that seem critical sometimes fail to influence short-term decisions, and studies that initially seem to have no influence can have a delayed impact when more friendly conditions arise. Despite this, there is broad consensus that the major goal of evaluation should be to influence decision-making or policy formulation through the provision of empirically-driven feedback (Trochim, 2006).

For the purpose of this research the author reflects on her own practice by evaluating the effectiveness of an information literacy workshop by comparing student performance in a pre-intervention test with that in a post-intervention test.

3.3 Research problem

As discussed in Chapter 1, the aim of this study is to investigate the effectiveness of an information literacy intervention for first year engineering students at the Cape Peninsula University of Technology. The research study gathers information to help the researcher develop library training workshops. As discussed in Chapter 2, information literacy is essential to life-long learning. The focus of this intervention is to develop life-long learning skills and to provide students with the opportunity to learn, to build up and empower themselves with the necessary skills required to become information literate, not only whilst achieving their higher education degree, but also for future careers in industry.

The ACRL Information Literacy Competency Standards, it is hoped, might provide an objective evaluation tool for the researcher to assess the effectiveness of her course. In higher education, and in real-life situations, people have to think actively and should know how to access, gather and process information. We are living in the information age, and those members of society who lack the skills required for a basic level of information literacy are at a disadvantage that could badly hamper their future development (le Roux, 2003).

3.3.1 Research questions

The following research questions arise from the research problem.

- Is the researcher's information literacy intervention in the first year engineering programme effective in teaching the outcomes it identifies?
- What factors affect its effectiveness?
- Do the ACRL standards provide a useful tool to assess the effectiveness of the intervention?
- How should information literacy programmes be delivered? For example, should they be embedded in courses? Or should the Library set up a standalone programme for all engineering students?

More specific questions that come from these were identified:

- Does the course teach students how to analyse their information needs?
- Does the course teach students how to find relevant information through searching the OPAC and the library's databases?
- Does the course result in an increase in the use of high-quality resources in the essay that is part of the Electrotechnology course?
- Does the course impact positively in terms of reduction of plagiarism and good referencing?
- Do computer literate students perform better than those with no computer literacy skills?

3.4 Research design and methodology

Trochim (2006) describes the research design as the *structure* of research which holds all of the elements in a research project together. He describes design as a brief document that enables the researcher to summarize a complex design structure efficiently. The research problem implies the need to determine the value and success rate of the information literacy intervention.

The project had seven phases:

- Phase 1: a questionnaire was designed using the ACRL standards. It is provided in Appendix B.
- Phase 2: a pilot study was conducted with information literate librarian colleagues to determine the reliability and dependability of the researcher's instrument.
- Phase 3: a second pilot study with Baccalaureus Technologiae (Btech): Environmental Engineering students checked if the questionnaire was easy to understand.
- Phase 4: respondents completed the pre-intervention test questionnaire
- Phase 5: two information literacy interventions with "hand-in" exercises were conducted. Students were asked to complete a feedback form.
- Phase 6: respondents completed the post-intervention test questionnaire.
- Phase 7: the pre- and post test scores were compared.

Two possible weaknesses must be recognised upfront. The design did not allow for a control group, whose scores might have been compared with the respondents' scores. It was decided that this would be beyond the scope of a mini-dissertation project. Also, the original proposal for the project included a follow-up essay which would allow the students to apply the skills learned in the intervention and the researcher to assess the longer term benefits. Unfortunately the plan could not be executed as the engineering lecturer, although initially having agreed to the plan, questioned the ethics of allowing a third party access to the essays.

The difference between the pre- and post intervention test scores should indicate the success of the workshops. The "test questions", use the ACRL Information Literacy standards as the benchmarks for Information Literacy. As explained in Chapter 1 these standards are well tested and accepted as reliable benchmarks. Powell states that "test-retest correlation" is a commonly used method where the researcher uses the "same data collection instrument to observe or collect scores twice for the same group of subjects" (1997: 41).

3.4.1 Pilot studies

Two pilot studies were conducted. The first pilot was conducted with information literate library staff at the Cape Peninsula University of Technology and the second pilot was conducted with BTECH Environmental Engineering students, at the Bellville campus at CPUT. The two pilots served to establish the validity, reliability and dependability of the instrument and to identify weaknesses and gaps in the questionnaire.

The questionnaire was presented to 45 library staff members and 26 returned it. Feedback received was that the tool is in fact valid and reliable with a few changes which were implemented. Some librarians thought that the questions were well constructed and covered the main areas of information literacy. Others commented that it was a good starting point to assess user needs. A few expressed their concern about the word 'anonymous' when students are required to provide their name and student number. The matter was clarified that the data would be recorded anonymously, but for the purpose of the pre-intervention test, the interventions and the post-intervention test it was crucial that students identified themselves to enable the researcher to match the pre- and post-intervention test results. Library staff members questioned the word 'wellbees' and one member did not answer the question because they did not know the meaning of the word. One member thought that the questionnaire was a bit daunting for first year students. Three staff members commented that Question 25 proved to be misleading and should add without using proper quotation marks or citing methods. The question was changed accordingly.

The second pilot with the BTECH students involved 25 respondents. This pilot study was also conducted to determine the time required to complete the questionnaire. A few questions were rephrased. The questionnaire was divided into two sections gathering firstly background information and, secondly, information skills.

3.4.2 Research instrument: pre- and post-intervention questionnaires

The research instrument is an evaluative questionnaire. Each student was supplied with a pre-intervention and post-intervention test questionnaire. The Information Literacy Competency Standards for Higher Education provided the framework for the evaluation. The ACRL document contains five standards and 22 performance indicators with a range of outcomes. Selected standards were used as a guideline to develop an assessment instrument measuring the respondents' progress toward information literacy.

The questionnaire is provided in Appendix B. It has two sections. The first section gathers biographical details and the second section tries to establish the level of information skills. The questionnaire consists of 25 questions providing a score of 30. Dichotomous questions ("yes" or "no") were used to collect background information in the first part of the questionnaire. Multiple choice questions were used during the second part of the questionnaire. It was important for respondents to identify themselves so that the researcher could match pre-intervention and post-

intervention test questionnaires. Students were requested to provide honest information and to answer openly. Explanations were given to those that misunderstood or misinterpreted some of the questions.

Questions 1-4 provide the researcher with each student's biographical details: name, student number, age, language preference. Information research skills such as mapping a search strategy and choosing bywords and synonyms are dependent on English fluency since English is the dominant language in CPUT databases. King (2007: 96) comments that research has revealed that English fluency is a factor that influences the information literacy of students.

Questions 5, 10, 11 and 12 seeks information regarding computer literacy level. Information technology and computer literacy plays an integral part in information- and academic literacy as students' level of computer literacy will vary. It was thus decided to ascertain the computer literacy levels of the first year Electrotechnology students entering the university. At CPUT, Cape Town campus students have 24 hour access to computers where they can work at their leisure.

Questions 6, 7, 8, and 9 identify participants' reading habits. Basic literacy skills start with reading and writing at an early age. This ability to read and write escalates as one requires the necessary information to solving problems and enhancing critical thinking skills. As described in Chapter 2, reading skill is accepted as one of the core attributes of an information literate person. A study conducted by Moyer (2007: 66) established the relationship between educational and recreational outcomes of leisure reading. Ajidahun (2006: 77) claims that good readers are well-informed and knowledgeable and to be ill-informed is to be deformed and academically incapacitated.

Questions 13 to 25 test information skills. They are based on the ACRL Standards. The following table lists the questions, explains their purpose and gives the relevant ACRL standard.

Table 1
Questions 13-25: Information skills and ACRL standards

Question 13:	To introduce yourself to the subject of "wellbees" which resource would you first consult?

Purpose of the question	ACRL Standard
The purpose of the question is to find out if students are aware that they can use an encyclopaedia to familiarize themselves with a certain topic. The option is provided to use either print or electronic media.	STD 1: 2 c and d
Question 14: Which resource would be the best to find synonyms for a given keyword?	
Purpose of the question	ACRL Standard
The purpose of Question 14 is to determine if students are familiar with the concept of a controlled vocabulary tool and if they are able to identify and find related terms and if they are acquainted with the thesaurus as a resource to find such information. Since a given concept may be represented by different terms, it is important and a good idea for students to consult a thesaurus, when formulating a search strategy. A thesaurus is a tool used that employs the same word expression to describe a given concept. When formulating a search strategy, students should identify synonyms and related terms to increase their research results. Mittermeyer and Quirion (2003: 41) state that in order to master the information research process and to develop a sound search strategy students should understand the concept of controlled vocabulary.	STD 1: 2 c STD 2: 2 b
Question 15: The print screen below refers to the various fields of an electronic catalogue record. Please fill in what each field is! Write your answer next to each letter.	
Purpose of the question	ACRL Standard
The purpose of this question was to identify if respondents are able to identify the various fields in an OPAC record.	STD 2: 1 d
Question 16: You have to write an essay on "The education of engineers at higher education institutions". Which search strategy would retrieve hits relevant to your exact topic? Take note of the Boolean operators, viz. AND, OR and NOT.	
Purpose of the question	ACRL Standard
The purpose of this question is to establish if respondents are able to distinguish between the three Boolean Operators and if respondents were aware of the different results they will retrieve if these indicators are not used correctly in a search strategy.	STD 2: 2 b, c and d
Question 17: By using the * (asterisks) as a truncation mark, which search of a database would give the largest number of hits?	

Purpose of the question	ACRL Standard
The purpose of this question is to establish if respondents are able to use the truncation mark (*) in a search strategy to maximize the search results. King (2007: 139 – 140) states that, although the truncation mark is in most cases used when searching electronic databases, it can still be used when searching the in-house catalogue for books or when searching search engines.	STD 2: 2 d
Question 18: You have to find the following journal article in the library. Since the article is not available in full-text you must find the print copy in the library.	
Purpose of the question	ACRL Standard
The purpose of this question is to identify if respondents are able to identify the various fields in an OPAC record. This allows respondents to identify publications by author, journal title, article title, place of publication, volume and numbering.	STD 2: 1 d
Question 19: A bibliographic database is? **Question 20:** You are doing a search of the databases and find a likely reference with the Portable Document Format (PDF) icon . It means:	
Purpose of the questions	ACRL Standard
The purpose of the question is to familiarize students with terms such as databases or electronic resources and the various formats results can be displayed in. Records can be retrieved in full-text either HTML format or PDF format.	STD 1: 2 c
Question 21: An abstract is?	
Purpose of the question	ACRL Standard
The purpose of the question is to point out to respondents that an abstract is a brief summary of the essential information contained in an article or book. An abstract always appears at the beginning of a manuscript, acting as the point-of-entry for any given scientific paper or patent application. Abstraction and indexing services are available for a number of academic disciplines, aimed at compiling a body of literature for that particular subject. The abstract of a thesis or article is a short summary that explains the main argument(s), topic(s) or findings.	STD 2: 1 c
Question 22: Which of the following references refers to a journal article?	

Purpose of the question	ACRL Standard
The purpose of the question is to find out if students are able to identify and point out the difference in sources. Respondents should also understand the uniqueness (characteristics) of various document types and if they know that a journal contains more recent information than other document types such as books.	STD 2: 5 c STD 5: 3 a
Question 23: You have read and cited the following article in your essay! By using the Harvard Referencing method, how would you reference the article in your bibliography? Provide your answer on the dotted lines. **Question 24:** To avoid accusations of plagiarism, it is important to: **Question 25:** Do you agree that: "It is OK to use someone else's idea / thought as long as you put it in your own words"?	
Purpose of the questions 23, 24 and 25	ACRL Standard
The purpose of the question is to familiarize students with the principles of the ethical use of information. The intention is to develop students' understanding of the economic, legal, and social issues surrounding the use of information. The aim of this question is to establish if students are able to demonstrate an understanding of what constitutes plagiarism. The information literate student acknowledges the use of information sources in communicating the product or performance. Plagiarism is a significant problem amongst students; it may be increasing as technology makes it easier to retrieve all or part of a paper from websites or to 'cut and paste' from several sources without proper credit (Carey and Zeck, 2003: 7).	STD 5: 2 f STD 5: 3 a

3.4.3 Research site and sampling

The research was conducted over two semesters as there are two intakes of first entry Mechanical Engineering students. The research was conducted at the Cape Peninsula University of Technology, Cape Town campus. The researcher received permission from the Dean of the Engineering faculty, the academics and students involved to conduct the study. The Cape Town campus was chosen because the researcher was the faculty librarian for the Engineering Faculty at the time the study was conducted. The researcher arranged with four academic staff members to use their respective periods, Electrotechnology 1 and Computer skills 1. One academic staff member was reluctant to sacrifice her class period to the information literacy (IL) intervention whereas the other academic staff members welcomed the opportunity for students to become information literate. They were all eager to have students become information literate but feared

that the periods given to them for the semester might not be enough to fit the IL intervention into their already busy schedules.

The researcher arranged with the two lecturers, teaching computer skills 1 and two lecturers teaching Electrotechnology 1 for the use of their class periods. The pre- and post-tests, which took a maximum of 20 minutes to complete, were conducted during the Electrotechnology class periods whereas the hands-on instruction interventions occurred during two 90 minute computer skills periods in the computer laboratory. The IL intervention sessions were presented to first year students enrolled for a Mechanical Engineering diploma, with Electrotechnology as one of their electives. Before the instruction session, the researcher consulted with the academia about the objectives of the IL interventions. The IL intervention sessions were conducted to develop students' critical thinking skills in the context of information seeking. The researcher was also interested in the connection between computer literacy and information literacy as her observations in conducting information literacy workshops in the library had been that computer literate students complete tasks faster than non-computer literate students.

The number of first year entry level students registered in the Faculty of Engineering is estimated at 1131 of which 225 students were registered in 2007 at the Cape Town campus for the Mechanical Engineering course. The sample size taken for the research is 4 classes of 129 students, who completed the pre- and post-intervention test questionnaires. The difference between the 129 in the study and the 225 first year students is explained by the fact that not all were enrolled for the computer literacy course in which the information literacy intervention took place. The sampling process was based on four groups, A1, A2, A3 and A4. Groups A1 and A3 provided a diverse setting with male and female as well as a linguistically diverse group, as opposed to the more homogeneous group A4, who were all Afrikaans speaking young men. The policy is that this group is formed only if there are enough Afrikaans students to warrant a separate class. After the first semester students are mixed according to the electives chosen and no preference is given according to language (Spencer, 2005). Group A2, consisting of an intake of 18% (24 respondents) during the second semester received the same pre- and post-test as well as the hands-on interventions.

It was stressed to the respondents that the information was only collected for research purposes and would have no bearing on academic results. Although the academics had expressed a keen interest in the training offered, in fact allocating time proved to be a difficult hurdle to overcome.

3.4.4 Interventions

Two workshops were conducted with the class as part of the course programme. The researcher, with the assistance of a colleague in the library, taught them. The desired learning outcomes were:

- Formulating the search statement
- Distinguishing among document types
- Information retrieval skills: search tools
- Locating and accessing
- Ethical use of information.

The lesson plans are provided in Appendix C.

The workshops are part of the information literacy programmes that the researcher has been developing with her colleagues in the Library. The aim is to teach students more comprehensive information handling skills and to highlight the importance of information skills in their academic study and career path. The researcher embarked on the IL interventions to bring forth change and to teach and equip students to become information literate individuals.

The first session with the respective classes was during the Electrotechnology1 period where the researcher was given a 30 minute slot to complete the first part of the IL interventions, viz, the pre-testing intervention questionnaires. The second and third sessions involved the hands-on training provided to students with hand-in exercises. Students were firstly familiarized with the OPAC / Aleph system to find books. Students were introduced to the institution's homepage and then the library's homepage. The ALEPH / OPAC searching provides the most basic form of searching and finding information. This allowed them the opportunity to find books on a certain topic. During this intervention students were given a hand-in-exercise (see Appendix D**,** Exercise 1: Catalogue / OPAC Aleph) where they had to retrieve two books on the topic "solar energy". With this exercise students were asked to provide the following bibliographic details per book, viz.: the author(s) / editor(s), title of the book, imprint and the shelf number. The researcher saw this as an introduction to the bibliographic details they would require at a later stage to draw up a bibliography.

Before students started with Exercise 4, they were given a demonstration of the Harvard Citation Referencing Method with examples on the institution's Intranet, explaining that a bibliography should contain sufficient information so that the reader can retrieve the item you have referenced. In-text referencing was explained with examples.

The issue of plagiarism was dealt with in great detail. Committing plagiarism is a serious offence and students were informed of this as well as taken to the CPUT's Policy on Plagiarism webpage which outlines and describes the procedures that are implemented should a student be found guilty of plagiarism. The policy document also provides an undertaking to be signed by students to ensure that their work is free of plagiarism. The researcher believes that many students are not aware of the plagiarism policy and the legalities that surround false use of data, academic dishonesty and plagiarism. This can only be eliminated by extensive training. Four lessons plans are attached as Appendix C.

3.5 Conclusion

This chapter has described the methods used to collect and analyze the data. King (2007: 85) notes that the majority of South African undergraduates arrive at higher education institutions without the necessary information literacy skills. This lack of skills is a major contributing factor to the high failure or drop out rate of first year students. Librarians are aware of the gaps in students' information skills.

This study aimed to assess the interventions' effectiveness in enabling students to retrieve and access information as well as create awareness of the legal and ethical issues surrounding research. The researcher is aware that information literacy cannot be taught in two 90 minute periods and that it should be implemented as an ongoing process. However, at the end of the interventions students should be able to formulate a search strategy, be able to find relevant information pertaining to their topic as well as be aware of plagiarism and be able to cite references. The following chapter will assess if these learning outcomes were achieved.

CHAPTER 4
SUMMARISING AND ANALYSING THE DATA

4.1 Introduction

Chapter 4 presents the data collected through the methods described in Chapter 3. It analyses the data gathered during the pre- and post-intervention test questionnaires. It follows the structure of the questionnaire on the whole but sometimes comment is made at a particular question on eventual test scores. For example in the breakdowns of respondents' languages and levels of computer literacy, the eventual scores of the groups are given. This is to save repetition later on in the report.

The empirical section of this research was conducted over a two semester period during 2007. 129 students received hands-on classroom instruction. Students completed a pre-intervention test prior to receiving instruction in a workshop that aimed to teach information skills useful for their course assignments. After instruction, students were tasked with four exercises.

The chapter also provides an analysis of the feedback received from students after the intervention since this contributes to the assessment of the programme.

4.2 Personal information

Students were requested to provide their name and student number to allow the research to match pre- and post-intervention test results but responses were dealt with anonymously. Demographic information about the enrolled respondents was analysed, allowing the researcher to examine information literacy skills in terms of home language and prior computer literacy education.

4.2.1 Gender and age

Out of a total of 129 respondents 83% (107) are males and 17% (22) are females. This matches the gender breakdown in the student population in the Engineering Faculty.

The clientele of the Mechanical Engineering students represents a diverse age group between 17 and 34 years**.** The average age is between 18 and 19 years. Respondents over the age of 19 make up a smaller population of 38.75% whereas the respondents aged between 17 and 19 make up the larger population of 61.25%.

4.2.2 Home Language

Students were asked to select one of the following languages as their mother tongue language, English, Afrikaans, Xhosa, Zulu, Sotho or Other. At the Cape Peninsula University of Technology, most of the academic education is presented in English. The researcher compared the results of English and Afrikaans as a first language compared with students who have another language as a mother tongue.

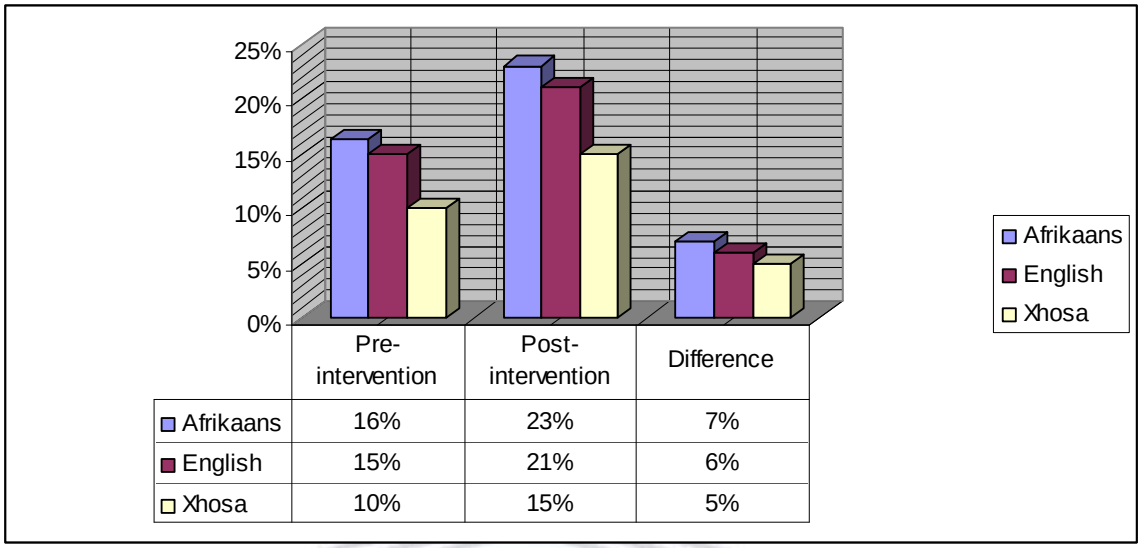
Table 2
Mother tongue language

	No of respondents	Percentage
Xhosa	42	33%
Afrikaans	31	24%
English	27	21%
Zulu	6	5%
Sotho	6	5%
Other: French	6	5%
Other: Tswana	6	5%
Other: Setswana	2	2%
Other: Venda	2	2%
Other: Ndonga	1	1%

As noted in Table 2, Xhosa as the mother tongue language provided an overwhelming percentage of 33%, where as the Afrikaans and English mother tongue languages represented 24% and 21% respectively.

Table 2 provides an analysis of before and after scores by language group. It shows that the scores of all language groups improved. Afrikaans-speaking students fared better in both the pre-intervention test and the post-intervention test than students with another language as a mother tongue.

Figure 4: Average performances by English, Afrikaans and Xhosa Mother tongue language



	Pre-intervention	Post-intervention	Difference
Afrikaans	16%	23%	7%
English	15%	21%	6%
Xhosa	10%	15%	5%

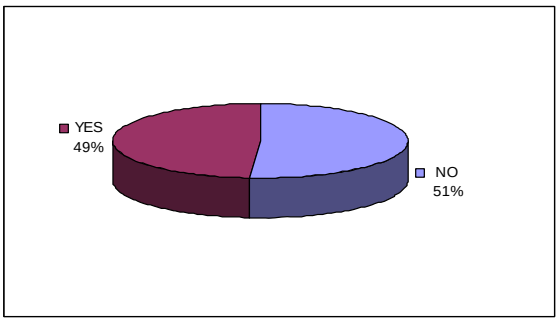
Figure 4 shows that Afrikaans students fared significantly better in both the pre- and post-intervention test. This and the improvement in scores for all groups suggest that the use of English might not be a barrier to students' learning.

4.2.3 Information and Communication Technology (ICT) literacy and access to ICT

As discussed in Chapter 1, computer literacy forms part of information literacy. The purpose of Questions 5 and 10 was to examine how many students had received computer literacy interventions either at school or elsewhere. These questions sought information regarding their computer literacy level, trying to judge participants' computer skills. The purpose of these questions is to provide the researcher with a greater understanding of the students' needs during her interventions and to see if those with computer literacy training performed better in the information literacy tests.

Figure 5 indicates that about half of the students claim to have received prior formal computer skills training: 49% answered NO whereas 51% answered YES, when asked if they had received computer skills training at school or elsewhere.

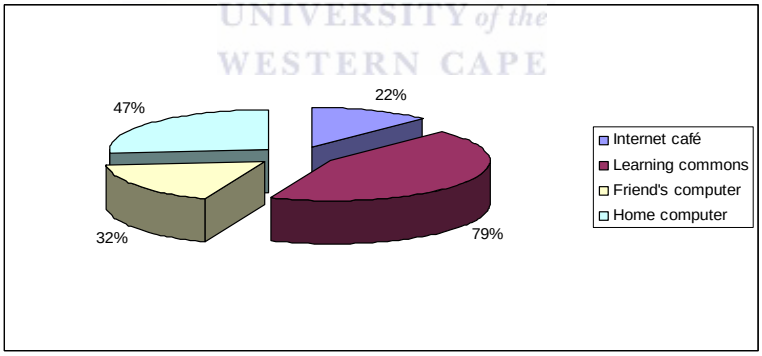
Figure 5: Computer literacy education



Question 10 asked if students had access to a computer at home. 62% indicated YES whereas 38% indicated NO. It can be assumed that the students with computers at home who had no formal training would probably have taught themselves computer skills.

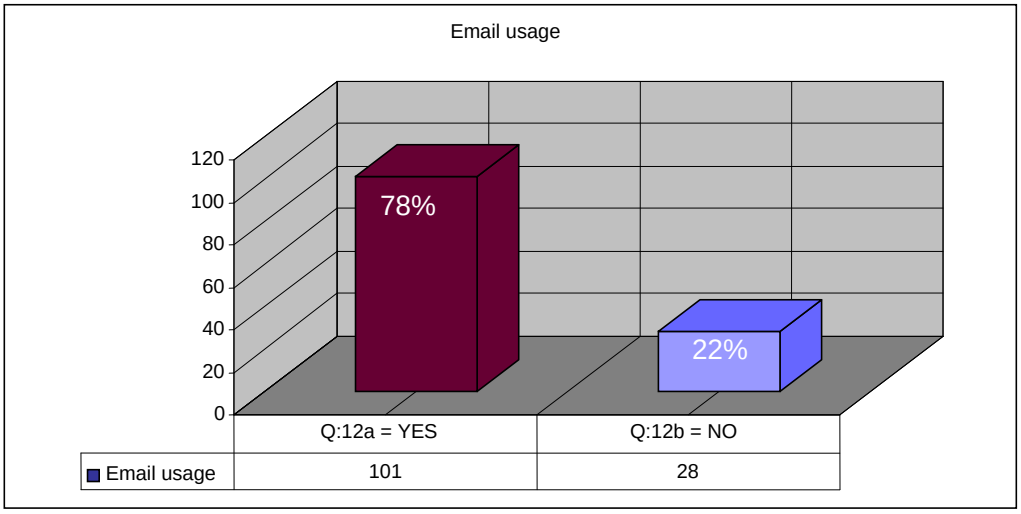
In Question 11, respondents were asked to name the ICT facilities they had used in the last month – allowing for more than one answer. 79% had used the Learning Commons, 47% had used a personal computer at home, 32% had used a friend's computer and 22% used Internet cafés.

Figure 6: Computer facilities used



Students were asked in Question 12 to indicate whether they use email. As Figure 7 indicates, only 22% indicated that they had not yet used email.

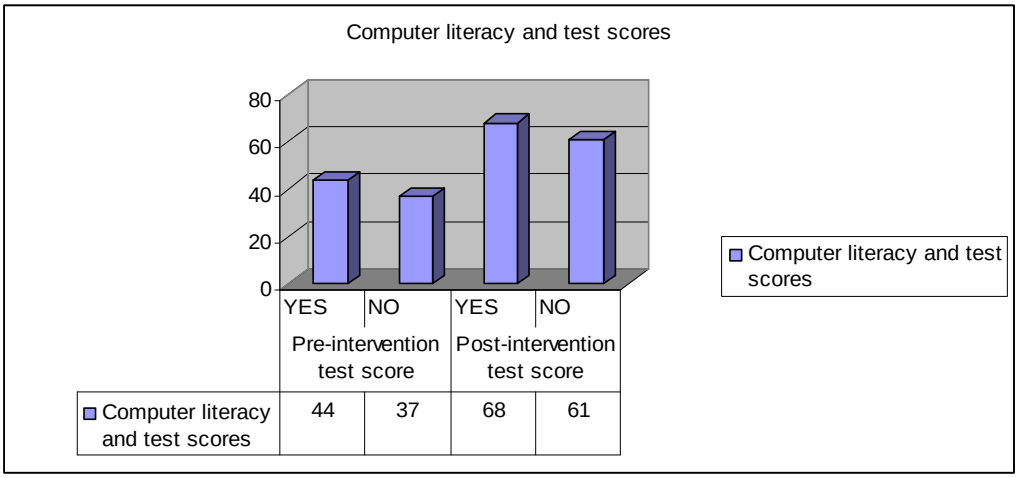
Figure 7: Email usage



Overall, the responses to the series of questions on ICT use and access indicate that it cannot be assumed that South African students – or those enrolled for engineering courses - do not have good access to ICT.

Another important question for information literacy education is the connection between computer literacy and information literacy. Figure 8 gives a comparison of the total score calculated for both the pre- intervention test score as well as the post-intervention test score of students who had received formal computer literacy education and those who had not. It indicates that there is not a big difference in the scores between the two groups.

Figure 8: Computer literacy and test scores



The analysis shows little difference between the two groups, both in the pre testing and the post. The implication for the researcher as an information literacy educator is that prior computer literacy education is not essential. However, another interpretation could be that students who claim to have attended formal computer literacy education might not in fact be any more computer literate than those who say they did not.

4.2.4 Reading habits

Questions 6, 7 and 8 sought to identify participants' reading habits. International research reveals that South African learners read very poorly, it is thought because they lack access to a wide range of reading materials at a young age and so do not develop the habit of reading.

Table 3 summarises the responses to Questions 6, 7 and 8, which ask about access to reading materials. 61% of students claim to buy books. The researcher realises that the question should have distinguished between textbooks and other books. 67% report that they had access to a school library, which is surprising given the low numbers of school libraries in South Africa as provided in recent research (LIS Transformation Charter, 2009). Answers to Question 8 show that 33% borrow books from public libraries – a higher proportion than the general South African population (Library Transformation Charter, 2009).

Table 3
Borrowing and purchasing reading material

Question		YES	NO	Unanswered
Question 6: Do you ever buy books?	**Count**	79	50	0
	%	60%	39%	0%
Question 7: Did your school have a library where you could borrow books?	**Count**	86	42	1
	%	67%	33%	1%
Question 8: Have you borrowed books from the public library in the past three months?	**Count**	43	86	0
	%	33%	67%	0%

The scores shown in Figure 9 for Questions 6, 7 and 8 indicate that students who do use public libraries score a slightly higher percentage in both the pre- intervention test and the post-intervention test. Students who do not borrow books from the public library score an average of 40% for the pre- intervention test and 62% for the post intervention test. Students, who borrow books from the public library, perform better and score a higher average of 43% in the pre-intervention test and 64% in the post-intervention test score. The students who buy books also score a higher average in both the pre-intervention test 43% and 63% in the post-intervention test.

Access to a school library might well be connected to performance. Students from schools with libraries score an average of 45% for the pre-intervention test score and 65% in the post intervention test, as opposed to 37% and 58% respectively in the pre- and post-intervention test scores of those without access to school libraries. Of course it might not be just the existence of a school library in their education that makes a difference to students' information literacy. In South Africa, as the LIS Transformation Charter (2009) points out, schools with libraries are the historically advantaged suburban schools, which still provide a better all round education than those in disadvantaged townships.

Figure 9: Purchasing and borrowing books

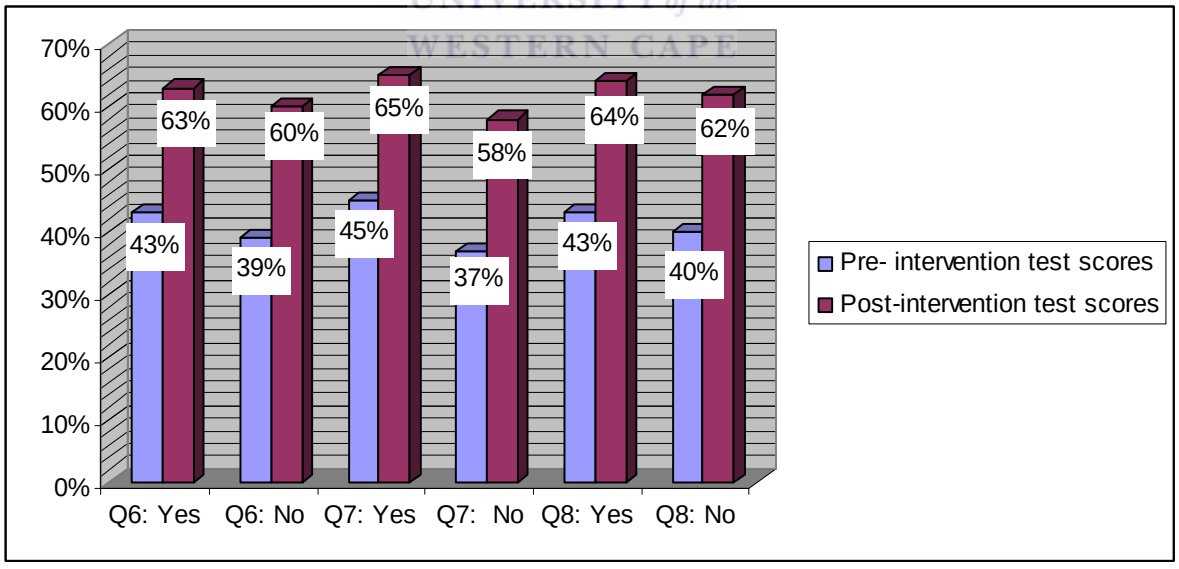
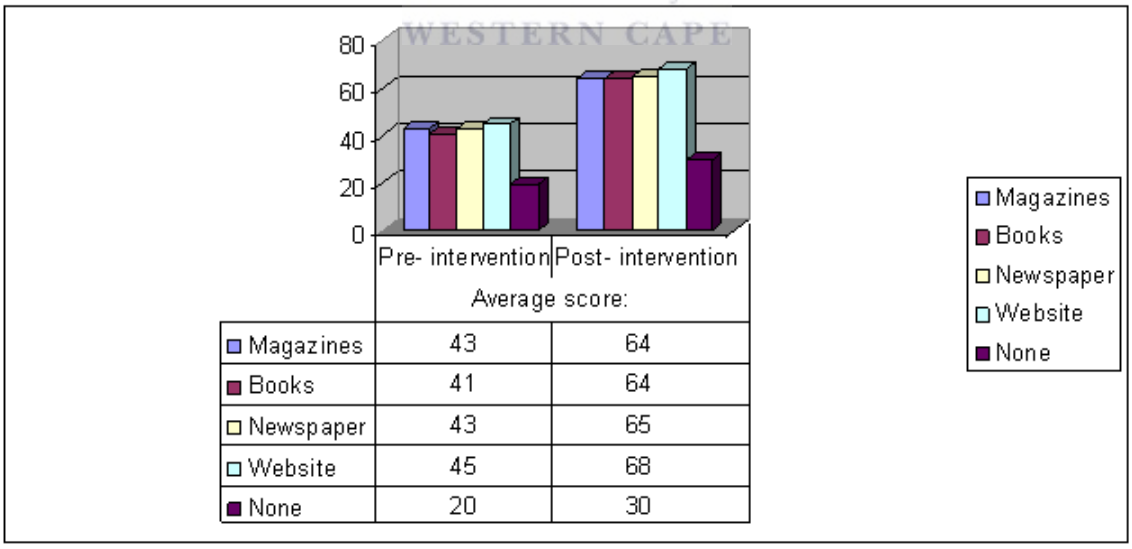


Table 4 summarises the responses to Question 9 which asks what participants had read in the past month. The results indicate that 81% read magazines, 51% read books, 73% read the newspaper, 69% read Websites.

Table 4 Reading habits		
Question 9: Which of the following have you read in the past month?		
	Percentage	**Count**
a. Magazine	81%	104
b. Book	51.%	66
c. Newspaper	73%	94
d. Website	69%	89
e. None	1%	1

It seems that respondents prefer quick reading materials such as magazines, newspapers and websites. A message for the Library could be to encourage students to expand and broaden their reading habits by using current periodicals as well as books dealing with the rising problems and ideas of their core business. This study tried to see if there is a major difference in the scores between those who read and those who do not. Students who do read scored a high percentage in both the pre-intervention test and the post-intervention test. Detailed results are recorded in Figure 10.

Figure 10: Respondents' reading habits and information skills scores



Average score:	Pre- intervention	Post- intervention
Magazines	43	64
Books	41	64
Newspaper	43	65
Website	45	68
None	20	30

4.3 Information skills assessment: scores in pre- and post-intervention tests

Questions 13 – 25 assessed knowledge before and after the workshops were conducted. The results are presented and grouped by ACRL standard.

The correct answers are indicated in bold typeface in the tables as well as on the questionnaire provided in Appendix 1.

4.3.1 Theme 1: Formulating the search statement (ACRL Standards: 1:2 c and 2: 2 b, c, d)

Table 5

Question 14: Which resource would be the best to find synonyms for a given keyword?

	Pre-intervention test		Post-intervention test		Difference
	Score	Percentage	Score	Percentage	%
a. Dictionary	70	54%	43	33%	-21%
b. Encycloaedia	10	8%	9	7%	-1%
c. A journal	**0**	0%	**2**	1%	1%
d. Thesaurus	40	**31%**	72	**56%**	25%
d. Don't know	9	7%	3	2%	-5%
TOTAL SCORE AND PERCENTAGE	**129**	**100%**	**129**	**100%**	

In the post-intervention test 56% of the respondents answered (d) which was the correct answer. A large percentage answered (a): dictionary, which could also be used to find synonyms to a given word. This is not completely incorrect. In the post-intervention test 33% continued to stick to their answer of dictionary as a source to find synonyms to a given word. A few students answered options (b) and (d) as their choices to find synonyms to a given word.

Table 6

Question 16: You have to write an essay on "The education of engineers at higher education institutions". Which search strategy would retrieve hits relevant to your exact topic? Give particular interest to the Boolean operators, viz. '**AND'**, '**OR'** and '**NOT'**.

	Pre-intervention test		Post-intervention test		Difference
	Score	Percentage	Score	Percentage	%
a. Education OR engineers OR "higher education"	4	3.%	4	3%	0%
b. Education AND engineers AND "higher education"	**91**	**71%**	**106**	**82%**	11%
c. Education NOT	**7**	5.%	**6**	5%	0%

engineers AND "higher education"					
d. Don't know	27	21%	13	10%	-11%
TOTAL SCORE AND PERCENTAGE	**129**	**100%**	**129**	**100%**	

The basic element of this question is to assess if the respondents were familiar with Boolean operators. Respondents were requested to combine various concepts after the researcher taught respondents the use of Boolean operators. Question 16 tests whether students know the difference between the 3 Boolean operators, AND, OR and NOT. These are used when searching databases or the World Wide Web.

82% answered correctly in the post-intervention test score, showing a 12% increase in the correct answer from the pre-intervention test.

Table 7

Question 17: By using the *(asterisk) as a truncation mark, which search of a database would give the largest number of hits?

	Pre-intervention test		**Post-intervention test**		**Difference**
	Score	**Percentage**	**Score**	**Percentage**	**%**
a. Librar*	20	16**%**	14	11**%**	-5%
b. Libr*	8	6**%**	8	6**%**	0%
c. Lib*	**56**	**43%**	**89**	**69%**	**26**%
d. Don't know	44	34**%**	18	14**%**	-20%
Unanswered	1	1**%**	0	0**%**	-1%
TOTAL SCORE AND PERCENTAGE	**129**	**100%**	**129**	**100%**	

The purpose of this question was to establish if respondents are able to use the truncation mark, the asterisk (*) in a search strategy to maximize the search results.The responses are recorded in Table 7. 69% (89) answered correctly in the post-intervention test compared with 43% in the pre-

intervention test. However, there are still a number of students who are not yet familiar with the concept of truncation and its usage even after the training. Hutcherson (2004: 353) warns that librarians' commonly used terms such as plagiarism, research and copyright, are accepted and understood as opposed to library jargon or library specific terms such as Boolean logic and truncation are not widely accepted. She states that students can often give a different meaning to what is typically understood and in so doing, it could be an impediment to students' understanding. There could be misunderstandings between librarians and students.

4.3.2 Theme 2: Document types (ACRL Standards: 1: 2 c, d)

ACRL Standards 1.2 c and d refer to the need to know a wide range of resources and when to use them in their information seeking.

Table 8

Question 13: To introduce yourself to the subject of "wellbees" which resource would you **first** consult?

	Pre-intervention test		Post-intervention test		Difference
	Score	**Percentage**	**Score**	**Percentage**	**%**
a. A book reporting on a recent conference?	20	16%	13	10%	-6%
b. A journal article reporting on a research study?	11	9%	10	8%	-1%
c. An encyclopaedia (i.e. print or online)?	**74**	**57%**	**98**	**76%**	19%
d. Don't know	24	19%	8	6%	-13%
TOTAL SCORE AND PERCENTAGE	**126**	**100%**	**129**	**100%**	

The percentage of respondents who chose option (c) in the pre-intervention test is 57% compared to the post-intervention test which is calculated at 76%.

Table 9

Question 20: You are doing a search of the databases and find a likely reference with the Portable Document Format (PDF) icon. It means:

	Pre-intervention test		Post-intervention test		Difference
	Score	**Percentage**	**Score**	**Percentage**	**%**
a. You can go to Google to retrieve the document.	11	9%	14	11%	2%

b. The library has a print copy of the journal.	11	9%	11	9%	0%
c. The article is available electronically in full-Text	**68**	**53%**	**85**	**66%**	13%
d. Don't know	39	30%	19	15%	-15%
TOTAL SCORE AND PERCENTAGE	**129**	**100%**	**129**	**100%**	

The purpose of the question was to find out if students understand the various document types and for them to familiarize themselves with a variety of formats results can be displayed. It is important to distinguish between different types of publications when conducting a search. Results do not all have the same objectives nor are they written for the same audience (Mittermeyer and Quirion, 2003: 46). The percentage of respondents who choose option (c) in the pre-intervention test is 53% compared to the post-intervention test which is calculated at 66%.

4.3.3 Theme 3: Information retrieval skills: search tools (ACRL Standards 1: 2 c and 2: 1 d)

The next group of questions tested knowledge of the library online catalogue – essential for retrieving materials in the library.

The purpose of Question 15 is to determine if students are able to distinguish between the various fields in entries on the library's electronic catalogue. These fields are important to assist the respondents to find the item on the shelf as well as assisting respondents with citation and bibliographic details.

Table 10

Question 15: The print screen below refers to the various fields of an electronic catalogue Record. Please fill in what each field is! Write your answer next to each letter.

Question:	**Pre-intervention test**		**Post-intervention test**		**Difference**
	Score	**Percentage**	**Score**	**Percentage**	**%**
15 a = Shelf no.	55.5	43%	90	70%	27%
15 b = Sub library	62	48%	99	77%	29%
15 c = Author	82	64%	112	87%	23%
15 d = Title	81.5	63%	109	85%	21%
15 e = Edition	72.5	56%	89	69%	13%
15 f = Place of publication	45	35%	64	50%	15%
15 g = Publisher	53	41%	70	54%	13%
15 h = Date of publication	75.5	59%	91	71%	12%
15 i = Subject heading	34.5	27%	52	40%	14%

It is clear from Table 10 that the interventions led to an increase in knowledge of all catalogue entry fields. However some fields were problematic even after the workshops. Only 40% could identify subject headings; only 50% knew about the place of publication; and only 54% could recognise the publisher.

Table 11

Question 18: Locate the following journal article in the library. Since the article is not available in full-text you must find the print copy in the library.

	Pre-intervention Test		**Post-intervention test**		**Difference**
	Score	**Percentage**	**Score**	**Percentage**	**%**
a. Author	26	19%	14	11%	-3%
b. Title	19	15%	12	9%	-6%
c. Journal Title	**39**	**30%**	**86**	**67%**	**37%**
d. Subject	16	12%	9	7%	-5%
e. other (please specify):	4	30%	5	4%	-26%
f. Don't know	25	20%	3	2%	-18%
TOTAL SCORE AND PERCENTAGE	**129**	**100%**	**129**	**100%**	28%

Although the library is moving towards electronic content, students must still be able to find print material. In Question 18, students are tasked to find the print copy in the library. Students must know the various steps to locate an article if the full text is not available. Question 18 assesses the student's understanding of the search indexes in the library catalogue. The purpose of the question 18 is to establish if students are able to use the library's catalogue and to distinguish between the different fields. As cited in King (2007: 67), Kunkel, Weaver and Cook (1996: 432) found that although 90% of students are able to identify the library catalogue as the retrieval tool to locate books, 30% think that they can locate journal articles by using the catalogue. The pre-intervention test scores indicate that the respondents were not familiar with the various search fields as only 30% answered correctly. A change is indicated in the post-intervention test score where 67% choose option (c) as the correct answer.

Table 12

Question 19: A bibliographic database is?

	Pre-intervention Test		Post-intervention test		Difference
	Score	**Percentage**	**Score**	**Percentage**	**%**
a. An electronic tutorial link published at certain intervals.	17	13%	9	7%	-6%
b. An electronic filing system which allows the user to find full-text and bibliographic information	**74**	**57%**	**97**	**75%**	**18%**
c. An electronic online guide to fiction and nonfictional information	12	9%	6	5%	**-4**%
d. Don't know	26	20%	17	13%	-7%
TOTAL SCORE AND PERCENTAGE	**129**	**100%**	**129**	**100%**	

The purpose of Question 19 is to establish if the students know what a bibliographic database is. There are various types of databases such as bibliographic databases, numerical databases, and image databases. Bibliographic databases list mainly journal and newspaper articles. In some cases, the full text of the article is also available. Databases may also list other references that cannot be found using the library catalogue (Mittermeyer and Quirion, 2003: 25). Question 19 establishes if students are familiar with the term, ''bibliographic database''. The intention of the training interventions is to provide confidence to students when they approach CPUT's electronic resources / databases. In Chapter 2, Hume's point on the need for support systems was mentioned (2001: 91). Information literacy education, as Kuhlthau (2004) stresses, aims to alleviate students' fears as they are faced with a daunting information explosion with a vast amount of information accessible from various platforms. It was pointed out during the interventions that some databases can be used to retrieve articles in periodicals but a catalogue, such as the OPAC/Aleph catalogue, does not provide the same function.

As indicated in the figure above, the improvement in pre- and post - scores is 18%.

4.3.4 Theme 4: Locate and access information (ACRL Standards: 2: 1 c)

The purpose of Question 21 is to point out the importance of reading an abstract before selecting the full article. Most commentators agree that students generally struggle with the concept of an abstract. In Question 21, students were asked to choose between four possible answers and so to indicate what an abstract is. After the intervention sessions scores increased by 18%.

Table 13

Question 21: An abstract is?

	Pre-intervention Test		**Post-intervention test**		**Diffe-Rence %**
	Score	**Percentage**	**Score**	**Percentage**	
a. A short story	12	9**%**	11	9**%**	0%
b. A list of books available in the library	10	**8%**	7	5**%**	**-3**%
c. A summary that covers the main points	**73**	57**%**	**97**	**75%**	18%
d. Don't know	34	26%	14	11**%**	-15%
TOTAL SCORE AND PERCENTAGE	**129**	**100%**	**129**	**100%**	

4.3.5 Theme 5: Ethical use of information (ACRL Standard 5: 2 f and 5: 3 a)

ACRL Standard 5 deals with the ethical use of information by correct and honest citing and referencing.

Question 22 aims to test whether students were able to distinguish between a journal citation and a book citation. An Internet citation, a book citation and a journal citation are given where students have to identify the correct citation. Detailed results are provided in Table 14. The majority of students, 69%, identified (b) as the correct answer in the post-intervention test. When comparing the pre-intervention test score with the post-intervention test score a difference of 15% was achieved after the training interventions.

Table 14

Question 22: Which of the following references refers to a journal article?

	Pre-intervention Test		Post-intervention test		Diffe-rence %
	Score	**Percentage**	**Score**	**Percentage**	
a. Brain, M. 2007. How batteries work. [Online]. Available: http://electronics.howstuffworks.com/battery.htm. [6 February 2007].	23	18%	18	14%	-4%
b. Janson, G. 1991. Polymers target broader areas of application in electrotechnology. Materials & design, 12(3):133- 137.	**70**	**54%**	**89**	**69%**	**15%**
c. Kiehne, Heinz Albert. Ed. 1989. Battery technology handbook. New York: M. Dekker.	33	26%	22	17%	-9%
Failed to answer	3	2%	0	0%	0%
TOTAL SCORE AND PERCENTAGE	**129**	**100%**	**129**	**100%**	

A slightly different picture is given in Question 23 when students were tasked to reference an article. After the interventions, it seems that students grasped the techniques of citing and referencing.

Table 15

Question 23: You have read and cited the following article in your essay! By using the Harvard Referencing method, how would you reference the article in your bibliography?

Answers to Question 23:	Score	Pre-intervention test		Post-intervention Test		Difference %
		Count	Percentage	Count	Percentage	

a. Author	(1)	54	42%	103	80%	38%
b. Date of publication	(1)	46.5	36%	98	76%	40%
c. Article title	(1)	31	24%	92	71%	47%
d. Journal title	(1)	27	21%	72	56%	21%
e. Journal title underlined	(1)	15	12%	46.5	36%	24%
f. Volume	(1)	19	15%	64.5	50%	35%
g. Issue	(1)	20.5	21%	61.5	48%	27%
h. Punctuation	(2)	15	12%	61	47%	35%
i. Pagination	(1)	43.5	34%	73	57%	23%
	10 marks allocated					

In this question students are tasked to reference a journal. One mark was given per correct answer except for (h), where students received 2 marks if the punctuation is correct. The purpose of the question is to determine if students are able to draw up a bibliographic reference. Students were requested to provide their answer on the dotted lines provided in the questionnaire. Detailed results are provided in Table 15. A low score count was received during the pre-intervention test but, after training, students demonstrated their understanding of the Harvard Citation Referencing Method, where 80% identified the author correctly and 76% identified the data of publication. When comparing the pre-intervention test scores with the post-intervention test scores, the above table clearly shows the improvement in the post-intervention test.

The purpose of Question 24 is to establish if students are familiar with the ethical and legal aspects of information literacy.

Table 16

Question 24: To avoid accusations of plagiarism, it is important to **:**

	Pre-intervention Test		**Post-intervention test**		**Diffe-Rence %**
	Score	**Percentage**	**Score**	**Percentage**	
	12	9%	7	5%	-4%

a. Paraphrase rather than directly quote.					
b. Use quotation marks for the direct quote.	19	15%	4	3%	**-12**%
c. Not pass another authors work off as your own.	9	7%	5	4%	-3%
d. Give recognition to your sources by correct and full citations.	13	10%	6	5%	-5%
e. All of the above	**65**	**50%**	**98**	**76%**	**26**%
Failed to answer	11	9%	9	7%	-2%
TOTAL SCORE AND PERCENTAGE	**129**	**100%**	**129**	**100%**	

To determine what students regard as plagiarism, respondents were asked to indicate which of the listed options they thought would exempt them from accusations of plagiarism. Detailed results are recorded in Table 16.

It is important for students to familiarize themselves with the principles of the ethical use of information. The purpose of this question is that the information literate student should follow the laws, regulations and institutional policies surround the legalities of research.

Table 17

Question 25: Do you agree that: "It is OK to use someone else's idea / thought as long as you put it in your own words"?

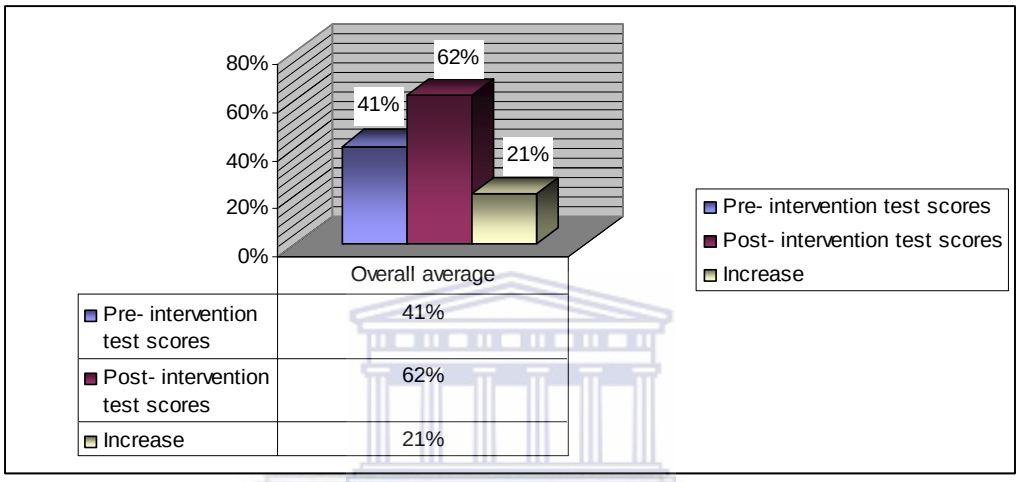
	Pre-intervention Test		**Post-intervention test**		**Difference**
	Score	**Percentage**	**Score**	**Percentage**	**%**
a. True	41	32%	16	12%	-20%
b. False	**74**	**57%**	**109**	**85%**	**28**%
c. Don't know	14	11%	4	3%	-8%
TOTAL SCORE AND PERCENTAGE	**129**	**100%**	**129**	**100%**	

57 % of participants identified the correct option (b) in the pre-test and 85% in the post-test

4.4 Pre- and post-test scores

The analysis of student responses in the post-test shows an improvement in scores across all questions. The following tables provide evidence for this statement. The difference between the pre-intervention test score and the post-intervention test score, as indicated in Figure 11, shows an average increase of 21% after the interventions. Eight students did not improve or performed worse.

Figure 11: Average increase



When the median is calculated it is found to be 40% for the pre-intervention test and 60% for the post-intervention test. This figure perhaps is more meaningful evidence of the impact of the interventions than the average.

Table 18 lists the highest increase in scores. Respondent number 45, a male English speaking student, scored an increase of 61% between the two test scores. Respondent number 110, a Zulu-speaking female, achieved a 47% increase between the pre-intervention test score and the post-intervention test score.

Table 18

Highest increase in scores

Respondent	Pre-intervention Test	Post-intervention test	Percentage increase
45	26	87	61%
110	13	60	47%

55	6	50	44%
95	26	70	44%
112	35	76	41%
53	36	76	40%
69	13	53	40%
77	20	60	40%
93	13	53	40%
117	13	53	40%
118	16	56	40%

4.5 Students' perceptions of the information literacy education intervention

As action research, the project aimed to assess the researcher's practices and to indicate areas that need changing. Therefore student feedback after the interventions had to be analysed.

Table 19 summarises students' responses to the simple assessment form handed out after the workshop. The positive claims that the training was useful and provided life-long skills are encouraging. However, the 36 negative replies to the question on whether they could use the databases on their own indicate a need for more extensive training.

Table 19
Evaluation of database training

	YES	NO
1. Did you find the training useful?	112	17
2. Would you be able to use the databases on your own?	93	36
3. Did the presenter make the training understandable to you?	102	27
4. Can you apply what you have leant as a life-long skill?	111	18

Students were then asked two open-ended questions:

- What did you like about the training session?
- Was there anything you did not like about the training session?

Tables 20 and 21 categorise their responses into units of meaning and give selected quotations in support.

Table 20

What did you like about the workshop?

Units of meaning	**Example of responses**
Learning new things	• "A very informative session, providing a step by step explanation which made it very easy to understand". • "I like the sound of the word 'credible information' … I now know the difference. I will definitely apply the searching skills". • "I walk out knowing more than before"
Useful for assignment writing	• "I have learnt how to search the catalogue and the databases". • "Helpful. I understand now how to do research".
Individual attention	• "I received individual attention"
Hands–on training	• "I like the fact that we had to do all the exercises ourselves so that we understand it better". • "It gave students a clear understanding of how to use the computers in the library and off-campus". • "I found out where to look for examples of Harvard referencing which is imperative in assignment writing". • "The training stimulated my computer skills".
Specific information skills	• "She gave nice examples of how to use the Harvard referencing method" • "Clear, simple and informative" • "The database training was amazing". • "One can find a wide variety of sources on the CPUT homepage (databases)". • "I now know more about plagiarism and citing" • "Gaining new knowledge and the easy way of searching for journals. I liked the session on plagiarism"

Presenter's style	• "The presenter was helpful and clear and patient and presented in a simple manner" • "Lovely, enthusiastic teacher. Useful and relevant notes for engineering students". • "The trainer was very thorough throughout the session. I have learnt a lot. Thank you! ☺" • "Good pace" • "Everything was clearly understood". • "The fact that she is passionate about the topic of information literacy and database searching made it interesting".

Table 21
What did you not like about the workshop?

Units of meaning	Example of responses
Environment	• The classroom was cold
Time constraints	• "Could not finish all the exercises, more time needed." • "The training was precise and to the point. Too little time as it was rushed at some point". • "Not enough time"
Connectivity Login problems	• "Login problems experienced", IT problems • "Computer froze"
Internet speed	• Slow Internet speed • "The Internet and Intranet was a bit slow".

The negative comments mostly refer to infrastructure, which is out of the control of the researcher. However, the comments on the need for more time are significant as they might point

to the main weakness of the intervention. They indicate that information literacy education needs a stronger place in the academic programme.

The comments on the specific skills learned provide more evidence to support that from the increase in scores. They refer to identifying their need, accessing the needed information and the legalities and ethics surrounding the use of information. They therefore refer to the learning that the ACRL standards aim at.

4.6 Conclusion

The data analysis in this chapter indicates that the interventions were effective. Only eight students did not improve their scores. Feedback from the evaluation forms indicates that the majority of the students recognize the value of information literacy education. The previous chapter recognised that a comparison with a control group would have reinforced this finding.

However, in concluding the data analysis for this chapter, the researcher hopes that this research will assist the faculty and the library to make informed choices in their decision making ensuring that the complexity of information literacy is taught effectively to undergraduate students, in preparation for their careers and post-graduate study.

CHAPTER 5
INTERPRETATION OF FINDINGS

5.1 Introduction

The previous chapter summarises and analyses the data gathered. Chapter 5 will interpret the findings to understand the research problem at a deeper level and to answer the research questions which were listed in Chapter 3.

5.2 Returning to the research questions

Chapter 3 describes the project as action research. Its aim is to gather evidence to assess the researcher's practice as an information literacy educator at CPUT Library.

This chapter interprets the data gathered and summarised in Chapter 4 to try to answer the project's research questions. In Chapter 3, the research questions were identified as follows:

- Is the researcher's information literacy intervention in the first year engineering programme effective in teaching the outcomes it identifies?
- What factors affect its effectiveness?
- Do the ACRL standards provide a useful tool to assess the effectiveness of the intervention?
- How should information literacy programmes be delivered? For example, should they be embedded in courses? Or should the Library set up a standalone programme for all engineering students?

More specific questions that come from these were identified:

- Does the course teach students how to analyse their information needs?
- Does the course teach students how to find relevant information through searching the OPAC and the library's databases?
- Does the course result in an increase in the use of high-quality resources in the essay that is part of the Electrotechnology course?
- Does the course impact positively in terms of reduction of plagiarism and good referencing?
- Do computer literate students perform better than those with no computer literacy skills?

It has to be stated at once that the data gathered do not answer all these questions. The original plan was to maintain an involvement with participants by working with the students and lecturer

in the writing and assessing of the Electrotechnology course essays. The skills covered in the interventions would have been reinforced by students' seeing the value their lecturer placed on them. Their use of resources and correct referencing techniques would have been assessed. The longer term benefits of the intervention might thus have been assessed. However, as described in Chapter 3, well into the project, the lecturer changed her mind fearing that it would be unethical to have an "outsider" look at her course essays.

However, the respondents as library users receive ongoing support from the library. The colleague who shared the session with the author and who has now replaced her as faculty librarian for engineering is aware of the aim to ensure that students are trained in the necessary information skills. She is building relationships with the students by ensuring that their information literacy skills are enhanced on an ongoing basis, by providing follow-up training sessions. She is also building relationships with academic staff.

5.2.1 The overall effectiveness of the information literacy intervention

The project identifies the lack of skills at entry level which indicates that the need for instruction from librarians is very real and much needed. The study thus confirms other similar research findings described in Chapter 2 (for example Ruth, 1997; De Jager and Nassimbeni, 2002; King, 2007).

The improvement in scores indicates that the workshops on the whole met the desired learning outcomes. There are shortcomings which will be discussed in the course of this chapter and again in the final chapter.

5.2.2 Background factors impacting on information literacy interventions: language and prior computer literacy

Another purpose of the study is to examine if background factors such as home language, prior computer literacy and reading habits affect the effectiveness of information literacy education programmes. As mentioned in earlier chapters, other researchers have highlighted the possible significance of these factors.

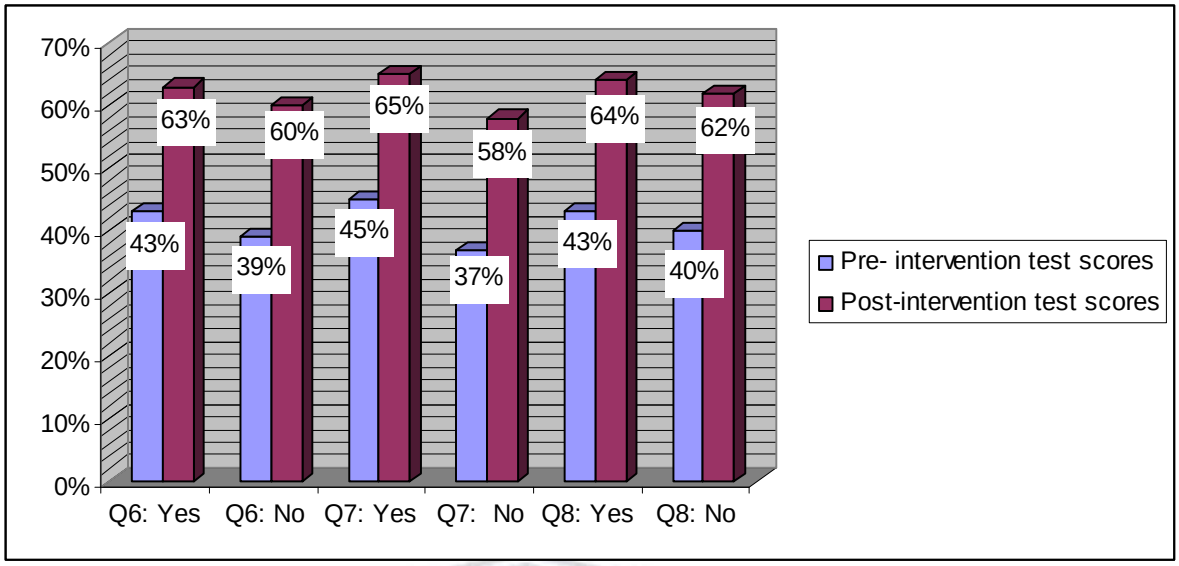
The analysis of data as described in Chapter 4 provides no strong evidence that students who speak English as a second language are handicapped. It is beyond the scope of the study to

investigate why Xhosa-speaking students perform less well than Afrikaans and English speaking. Probably it has to do with school background.

With regard to computer literacy, the fact that those students who reported prior computer literacy training performed no better than those who had none, shows that information literacy programmes need not insist on prior computer literacy training. The finding reinforces the comment in the literature that information literacy is not the same as computer literacy. The computer literacy education participants had received seems to have little impact on the scores. The ACRL standards assess high-level cognitive processes rather than basic computer skills. However, common sense and the researcher's experience in the library indicate that basic keyboard and mouse proficiency helps in database searching.

As explained in Chapters 3 and 4, the researcher's questions on reading habits and prior experience of libraries were based on the idea that people who read and who have had access to school libraries might have higher levels of information literacy than those who do not. Question 6 asked whether students buy books; Question 7 asked whether participants had access to a school library; Question 8 asked whether they had borrowed books from a public library in the last three months. Figure 12 summarises the answers and compares them with the pre- and post-test scores. The finding is that there is little difference between those who answered positively and those who answered negatively. Question 7 has the biggest difference – with those reporting a school library getting 65% and those with no school library getting 58%. Perhaps it would have been better to ask students if they had had information skills education at school.

Figure 12: Reading behaviour and pre- and post-test scores



5.2.3 Are the ACRL standards a useful tool in assessing information literacy interventions?

As pointed out in Chapter 1, the ACRL standards are internationally accepted as valid benchmarks and measures of information literacy. The standards provide a theoretical and practical framework to guide intervention planning and implementation.

Chapter 3 identified the specific ACRL standards that were taught and assessed in the information literacy intervention. The standards focussed on are those that deal with analysing a topic, analysing a need for information, deciding which sources are suitable, designing a search strategy and the ethical use of information.

Chapter 4 has shown the positive outcomes of the intervention in terms of test scores. However, certain limitations have to be acknowledged. The intervention was a once-off three hour session. The original plan included involvement in and assessment of student assignments in the weeks following the intervention. ACRL Standard 5 is maybe the most in doubt. The intention was to assess student assignments in terms of avoidance of plagiarism and correct referencing. As discussed in Chapter 3, this was not possible because the lecturer had second thoughts. She believed that it would not be ethical for the researcher to have access to the assignments. This issue will be returned to in the following chapter as it might show the need for change in attitude amongst some academic staff.

5.2.4 How should information literacy education be delivered?

The improvement in scores and the positive feedback received from students that was described in Chapter 4 indicate that all students should have access to the intervention or similar ones. The project highlighted the value of practical hands-on exercise. However, several students commented that the time was too short and that the author spoke too fast in trying to cover a lot of material. The fact is that the post-intervention test scores show room for improvement. The doubts over the durability of the learning as well as the comments from students indicate that the intervention needs expanding.

As mentioned in Chapter 2, the literature on information literacy education agrees that the most effective way to teach information skills is to embed them in subject learning. The researcher's interventions were embedded in the Electrotechnology 1 course up to a point only. Teaching time was allocated to them and all students attended as part of the course. However, the researcher's lack of ongoing involvement in the major course assignment hindered ongoing integration of the information literacy learning into the course.

The lecturer's decision not to provide access to students' assignments is in itself an important finding as it points to a lack of trust in a librarian as a teaching partner. If such attitudes towards librarians are common, they might stand in the way of embedding information literacy education in courses.

There are three alternative approaches:

- The Engineering Faculty librarians could set up a standalone information literacy course for first year engineering students. However, there would be some challenges. However positive participants were towards the researcher's intervention, it is doubtful that they would voluntarily enrol for an extended course. Formal accreditation would make the course "count" but course accreditation processes are difficult. Another challenge would be to design meaningful assignments to exercise and test students' information literacy skills.
- A home for information literacy education could be found in the existing computer literacy and communication skills programmes. These are compulsory for all first year engineering students. The challenge would be to convince the people who run these programmes of the need for more than a short slot in their programmes. The interventions should be conducted over three double period slots in these first year

courses. The course would need a project in which students would practice and demonstrate their information literacy.

- Provide as many information literacy interventions throughout the year as possible. Provide structured sessions as well as non-structured sessions where a programme can be made available for students to attend when suited. Attention should be given to the time frame of the information literacy interventions. Students' comments in the researcher's intervention that there was too much material being presented in too short a time suggest that librarians must allocate generous time for hands-on practice.

However, the researcher believes that her project provides enough evidence to persevere with the current programme. The foothold is there. The challenge is to convince the lecturers in the Electrotechnology course and their colleagues of the need for more ongoing involvement by librarians in the learning programme and for more time in their courses. As Nassimbeni and De Jager's survey of information literacy practices in South African universities (2002) found, academics' attitudes provide the biggest challenge.

CHAPTER 6
REFLECTIONS AND RECOMMENDATIONS

6.1 Introduction

The final chapter reflects on the research project and provides recommendations for CPUT Library's information literacy programmes. It concludes the dissertation with some suggestions for further research.

6.2 Reflections on the research project

The main purpose of this research study is to assess the information literacy intervention in the Electrotechnology course in order to gather information on how library information literacy programmes at CPUT might be improved.

Having completed the project, the question must be "Was the purpose achieved?" The answer is that it was. The project revealed the strengths and the weaknesses of the approach to information literacy education. The data gathered shows that the workshops were effective in terms of improved scores and students' positive feedback on their learning.

However, there are some doubts. The fact that the researcher could not view students' assignments leaves a question mark over the longer term benefits of the training. The withdrawal of the lecturer left her unsure of the viability of the project. Its revelation of the lack of trust shook her. But as mentioned earlier, it is itself an important finding. Any future planning must recognise the need to convince academics of two things:

- The need for information literacy education in university education
- Librarians, as information literacy specialists, are educational partners.

The project shows the importance of needs assessment before implementing information literacy education. The pre-intervention test scores indicated the areas where the researcher should place greater emphasis during the interventions such as, bibliographic referencing, citing and ethical use of information. Respondents' performance served to measure the success of the interventions. It is recommended to have an information literacy policy in place where all incoming students will be tested when entering the University for information literacy skills. They may then register

for the information literacy practical interventions where students are trained in using the electronic resources, the World Wide Web and scientific writing.

The hurdles the researcher faced in the project highlight the problems faced in the day to day work of librarians at CPUT. Information literacy facilitators face challenges before and during the information literacy instruction sessions, for example:

- Difficulty in getting class periods
- Full cooperation is not always received by all students
- Time frame for hands-on instruction is pointed out by students as too short
- Full cooperation by the faculty is not received.

6.3 Recommendations

This final section makes some recommendations that come out of the project and the answers to the research questions which were provided in Chapter 5.

Advocacy

Both students and academics need to be educated in the importance of information literacy in life-long learning.

It is important to market the information literacy intervention programme broadly to the CPUT community. The library must be seen as a dynamic partner working in collaboration with the faculty to integrate the information literacy course into the programmes. Collaboration between faculty and library is required to enhance information literacy skills for students ensuring that they are empowered and equipped for the corporate world. The course should be marketed extensively during orientation, via email and the Hub (student paper) and Moja (staff news paper).

Faculty have to buy into the programmes. Information literacy education has to become a whole university programme. An information literacy task team was established in 2005 to implement a programme across faculties but with the merging of the two technikons this project was never fully implemented. The information literacy policy was drafted in June 2009, after the researcher's study was completed.

Whole library programme

Similarly information literacy must become a whole library programme. It does not belong only to faculty librarians. All library staff need to be skilled by means of staff development opportunities to enhance their teaching/facilitating skills. Staff must be kept abreast of recent developments within the library profession and should be encouraged to share and benchmark ideas with other libraries.

Faculty librarians should also share among themselves. The following guidelines might be useful:

- Training material can be developed and shared
- Assessment methods can be shared
- Turnit-in, the plagiarism prevention tool, and Refworks, the citation tool, could be incorporated into the information literacy programme.

Support from management inside and outside the Library

Changing attitudes may be beyond the capacity of individual faculty librarians. A library-wide strategy to educate academics in the importance of information literacy education has to be built and senior library management will have to take the lead. The arrival of a new library director and the appointment of several new senior managers, after several difficult years, might lead to an improvement in the position of the library. Library management should request faculty participation at the deans and faculty meetings.

De Jager and Nassimbeni (2002) note that Government's lack of recognition of the contribution of libraries to its developmental goals might be reflected in the neglect of information literacy and libraries in universities' strategic mission statements.

6.4 Further research

The researcher recommends continuous research in the field of information literacy. Continuous research is required to keep abreast with changes in electronic resources and disciplines. New improved information literacy interventions should be designed and adapted to suit the needs of the changing student body and changing disciplines. For example CPUT will be taking in larger numbers of so called generation Y students in the future. The library needs to investigate how to adapt its programmes to these sophisticated computer users who might well be skilled social networkers, but who lack information literacy.

More research needs to be done in how to adapt information literacy programmes to different disciplines like engineering. Despite this, King's comment on the need for a transparent theoretical framework must be taken into account (2007: 179).

A longitudinal study should be conducted to determine what value information literacy skills have on the students' academic success, institutional throughput and retention rate. It would be useful to assess how information literacy workshops impact on students' academic performance across their studies.

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APPENDIX A

INTRODUCTORY LETTERS

UNIVERSITY of the WESTERN CAPE

University of the Western Cape
Private Bag X17
Bellville
7535

Date: 28 February 2007

Cape Peninsula University of Technology (CPUT)
PO Box 1906
Bellville
7535

Dear Dr. Franks

I am currently pursuing a master's qualification (MBibl) at the University of the Western Cape in the field of Library and Information Science. In order for me to complete my degree, I have decided to do primary research at the Faculty of Engineering, Cape Town campus. My thesis is entitled: Evaluating an information literacy intervention for first year engineering students at the Cape Peninsula University of Technology. The research is conducted under the supervision of Associate Professor G. Hart.

I am hereby requesting permission to conduct research at the Faculty of Engineering to help me develop library training workshops. This letter serves to inform you that the information gathered will be solely for research purposes and that responses will be treated with the utmost confidentiality and respondents will remain anonymous. Respondents can withdraw at any stage.

For your perusal, I have attached a covering letter for students, the research instrument and the lesson plans to be used during interventions.

Yours truly

Marion Davids
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Cape Peninsula University of Technology
Tel: +27 21 959 6926
Fax: +27 21 959 6605
Email: DavidsML@cput.ac.za

UNIVERSITY of the WESTERN CAPE

University of the Western Cape
Private Bag X17
Bellville
7535

Date: 28 February 2007

Cape Peninsula University of Technology (CPUT)
PO Box 1906
Bellville
7535

Questionnaire on information literacy: an intervention offered to first year, mechanical engineering students at The Cape Peninsula University of Technology (CPUT).

Dear student

I am currently pursuing a master's qualification (MBibl) at the University of the Western Cape in the field of Library and Information Science. In order for me to complete my degree, I have decided to do primary research at the Engineering faculty, Cape Town campus. My thesis is entitled: Evaluating an information literacy intervention for first year engineering students at the Cape Peninsula University of Technology. The research is conducted under the supervision of Associate Professor G. Hart.

The attached questionnaire covers a range of subject matters pertaining to information seeking. The purpose of this questionnaire is to help me develop library training workshops. You are hereby requested to complete the attached questionnaire. All responses will be treated with the utmost confidentiality and respondents will remain anonymous. You may withdraw at any stage.

Your answers to the questionnaire will have no bearing on our academic results.

Thanking you for your co-operation in this matter.

Yours truly

Marion Davids
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Cape Peninsula University of Technology
Tel: +27 21 959 6926
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Email: DavidsML@cput.ac.za

APPENDIX B

RESEARCH INSTRUMENT

UNIVERSITY of the WESTERN CAPE

Title: Evaluating an information literacy intervention for first year engineering students at the Cape Peninsula University of Technology

INFORMATION LITERACY QUESTIONNAIRE

PRE- AND POST-INTERVENTION TEST

Instructions

Your responses are anonymous and it is important to answer all questions, as there is no right or wrong answer. Try to answer as accurately as you can.

Background information						
1. Name and student number (required by the researcher to match pre + post intervention test results)	Group: _____ Name and surname: _____ Student number: _____					
2. Gender:	Male		Female			
3. Age:						
4. Home language?	English	Afrikaans	Xhosa	Zulu	Sotho	Other (please specify):

Circle or tick the most appropriate answer to the following questions.

5. Have you done a computer literacy course at school or elsewhere?
   a. Yes
   b. No

6. Do you ever buy books?
   a. Yes
   b. No

7. Did your school have a library where you could borrow books?
   a. Yes
   b. No

8. Have you borrowed books from the public library in the past three months?
    a. Yes
    b. No

9. Which of the following have you read in the past month? You may tick more than one.
    a. Magazine
    b. Book
    c. Newspaper
    d. Website
    e. None

10. Do you have a computer at home?
    a. Yes
    b. No

11. Which of the following facilities have you used in the past month? You may tick more than one.
    a. Internet café
    b. CPUT's learning commons / knowledge centre.
    c. A friend's computer
    d. Your own computer at home

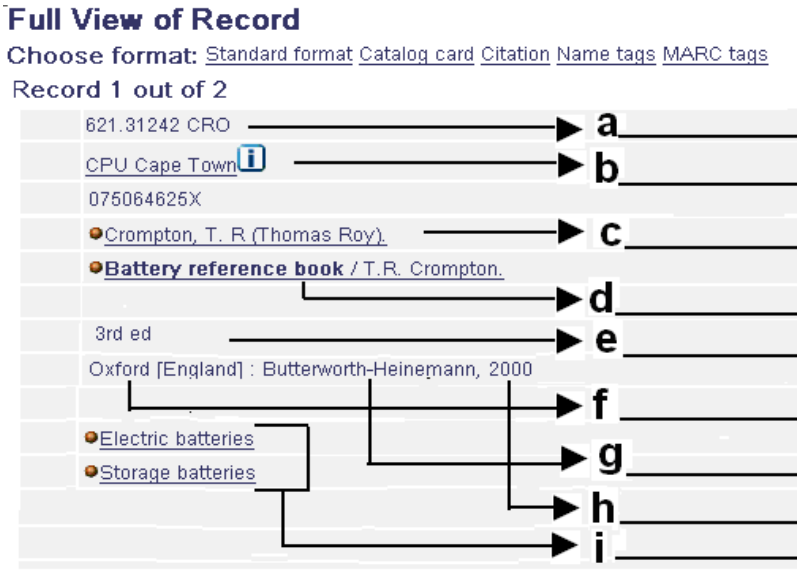
12. Do you use email?
    a. Yes
    b. No

Information skills

13. To introduce yourself to the subject of "wellbees" which resource would you **first** consult?
    a. A book reporting on a recent conference
    b. A journal article reporting on a research study
    c. An encyclopaedia (i.e. print or online)
    d. Don't know

14. Which resource would be the best to find synonyms for a given keyword?
    a. Dictionary
    b. Encyclopaedia
    c. A journal
    d. Thesaurus
    e. Don't know

15. The print screen below refers to the various fields of an electronic catalogue record. Please fill in what each field is! Write your answer next to each letter.



16. You have to write an essay on "The education of engineers at higher education institutions". Which search strategy would retrieve hits relevant to your exact topic? Take note of the Boolean operators, viz. AND, OR and NOT.
    a. Education OR engineers OR "higher education"
    b. Education AND engineers AND "higher education"
    c. Education NOT engineers AND "higher education"
    d. Don't know

17. By using the * (asterisks) as a truncation mark, which search of a database would give the largest number of hits?
    a. Librar*
    b. Libr*
    c. Lib*
    d. Don't know

18. You have to find the following journal article in the library. Since the article is not available in full-text you must find the print copy in the library.
    Reference: Prasad, J and Diaz, A.R. 2006. Synthesis of bistable periodic structures using topology optimization and a genetic algorithm. Journal of mechanical design, 128(6):1298-1306.
    To find the article in the CPUT library, you use the electronic catalogue and:
    a. In the **Author** field type: "Prasad and Diaz"
    b. In the **Title** field type: "synthesis of bistable periodic structures using topology"
    c. In the **Journal Title** field type: "journal of mechanical design"
    d. In the **Subject** field type: "bistable periodic structures"
    e. Other (please specify):
    f. Don't know

19. A bibliographic database is?
    a. An electronic tutorial link published at certain intervals.
    b. An electronic filing system which allows the user to find full-text and citation records.
    c. An electronic online guide to fiction and nonfictional information.
    d. Don't know

20. You are doing a search of the databases and find a likely reference with the Portable Document Format (PDF)  icon. It means:
    a. You can go to Google to retrieve the document.
    b. The library has a print copy of the journal.
    c. The article is available electronically in full-text.
    d. Don't know

21. An abstract is?
    a. A short story.
    b. A list of books available in the library.
    c. A summary that covers the main points.
    d. Don't know

22. Which of the following references refers to a journal article?
    a. Brain, M. 2007. How batteries work. [Online]. Available: http://electronics.howstuffworks.com/battery.htm. [6 February 2007].
    b. Janson, G. 1991. Polymers target broader areas of application in electrotechnology. Materials & design, 12(3):133-137.
    c. Kiehne, Heinz Albert. ed. 1989. Battery technology handbook. New York: M. Dekker.

23. You have read and cited the following article in your essay! By using the Harvard Referencing method, how would you reference the article in your bibliography? Provide your answer on the dotted lines.

    Journal title: Renewable Energy
    Article title: Analysis of wind flow around a parabolic collector (2) heat transfer from receiver tube
    Pages: 1259 – 1272
    Authors: N. Naeeni and M. Yaghoubi
    Volume: 32
    Issue: 8
    Date of publication: 2007

……
……
……

24. To avoid accusations of plagiarism, it is important to:
    a. Paraphrase rather than directly quote.
    b. Use quotation marks for the direct quote.
    c. Not pass another authors work off as your own.
    d. Give recognition to your sources by correct and full citations.
    e. All of the above
    f. Don't know

25. Do you agree that: "It is OK to use someone else's idea / thought as long as you put it in your own words"?
    a. True
    b. False
    c. Don't know

Thank you for your participation!

APPENDIX C

LESSON PLAN 1

INFORMATION LITERACY FIRST INTERVENTION

(45 minute SESSION)
LESSON 1

Elective: Electrotechnology 1:
Venue: Lecture hall

	ACTIVITY	**DURATION**
1	Introduction ❑ Introduction and overview of the research ❑ Explaining the questionnaire ❑ Circulate attendance register ❑ Give an overview of the training sessions.	10 min
2	❑ Completing the questionnaires	30 min
3	End session	5 min

INTERVENTION LESSON PLAN 2

INFORMATION LITERACY FIRST INTERVENTION

(90 minute SESSION)
LESSON 2

Elective: Computer skills 1:
Venue: Computer Laboratory
Date: Tuesday, 6 March - 13:45 - 15:15 (1hr 30 min)

	ACTIVITY	**DURATION**
1	Introduction ❑ Introduction ❑ Circulate attendance register ❑ Give an overview of the training session.	5 min
2	Induction to the library's homepage. ❑ Introduction to Aleph/OPAC (Library's online catalogue) o Purpose (What it can do for you) o Basic Search o Understand results lists o Email / save results [Demo by facilitator]	15 min
Exercise 1	Practical: Students practice by performing various searches on the OPAC.	20 min
3	Intro to the electronic resources incorporating: o Boolean logic o Difference between full-text and citation records. o Scholarly articles Databases: o Science Direct (full-text) o Engineering Village (partial full-text) o EbscoHost A-Z (full-text retrieval database) [Demo by facilitator]	20 min
Exercise 2	Practical: Students to perform keyword searches, on the above mentioned databases by using Boolean operators.	30 min
4	End Session	

INTERVENTION LESSON PLAN 3

INFORMATION LITERACY SECOND INTERVENTION

(90 minute SESSION)

LESSON 3

Elective: Computer skills 1:
Venue: Computer Laboratory
Date: Thursday 7 March - 11:30 - 13:00 (1hr 30 min)

	ACTIVITY	DURATION
1	Introduction ❑ Welcome students to the 2nd session. ❑ Circulate attendance register	5 min
2	Second introduction to the electronic resources: See what students can remember from previous training session. o Boolean logic o Difference between full-text and citation records. o Scholarly articles Databases: o Science Direct (full-text) o Engineering Village (partial full-text) o EbscoHost A-Z (full-text retrieval database) [Demo by facilitator]	15 min
Exercise 3	Practical: Students to perform keyword searches on the above mentioned databases by using Boolean operators.	20 min
3	Introduce plagiarism, citing methods and Harvard Citation Style o [Demo by facilitator]	20 min
Exercise 4	Practical: Students to compile a bibliography of different sources.	30 min
4	End session	

LESSON PLAN 4

INFORMATION LITERACY FIRST INTERVENTION

(45 minute SESSION)
LESSON 4

Elective: Electrotechnology 1
Venue: Lecture hall

	ACTIVITY	**DURATION**
1	Introduction ❑ Circulate attendance register ❑ Thanked students for participating in the research study ❑ Received a general overview	10 min
2	❑ Completing the post-intervention questionnaire	30 min
3	❑ Completing evaluation forms	5 min

APPENDIX D

HAND-IN EXERCISES

Exercise 1: OPAC Catalogue / Aleph

Electrotechnology 1

Hand-in exercise

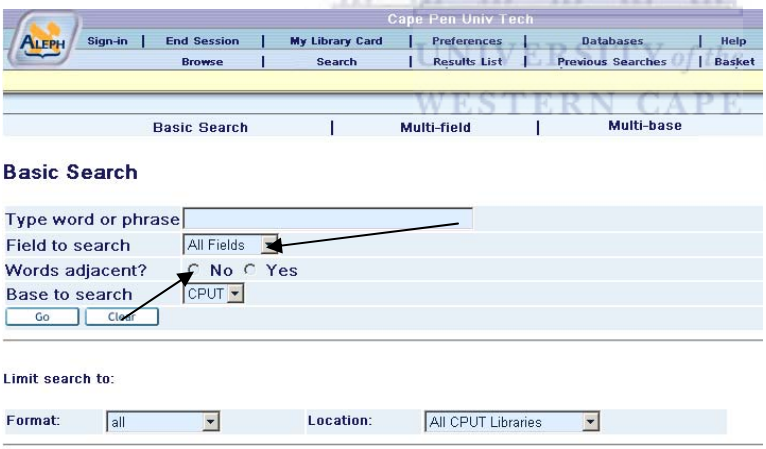
Name and surname: _____
Student number: _____
Group: _____
Date: _____

By using the Basic search function, locate the following items by using the Catalogue known as Aleph.

You have been given an assignment on **solar energy**. Your first attempt to find books in the library will be to conduct a keyword search via the Catalogue.

By using the "All Fields" search field type in the keywords **solar energy**. Make sure that you have unchecked the "not adjacent" field by checking the **No** field.

To access the catalogue use the address: http://www.cput.ac.za
Click on Library
Click on Catalogue



Write down the bibliographic details of 2 suitable books which you would use for your assignment.
You will need the shelf number to retrieve the physical item in the library.

Book 1:
Author: _____
Title: _____
Shelf number: _____
Date of publication: _____
Place of publication: _____
Publisher: _____

Book 2:
Author: _____
Title: _____
Shelf number: _____
Date of publication: _____
Place of publication: _____
Publisher: _____

Exercise 2: Database searching and Boolean Logic

Electrotechnology 1

Hand-in exercise

Name and surname: _____
Student number: _____
Group: _____
Date: _____

Activity 1: Science Direct

Find the article written by **Xinjing Zou** on **photo-rechargeable battery fiber electrodes.**
Date of publication: 2000
Use the **Science Direct** database.

Please provide the following information:
Article title: _____

Journal title: _____

Volume and issue: _____

Date of publication: _____

Activity 2: Boolean operators (AND, OR, NOT)

By using the Science Direct database, how many records do you retrieve when doing the following keyword searches? Please ensure that your dates selected are **1997 – present**, as per the default setting.

Solar energy **and** solar power _____
Solar energy **not** solar power _____
Solar energy **or** solar power _____

Activity 3: Engineering Village

By using the **Engineering Village** database conduct a search by using the **AND** operator. Select the dates **2004 - 2007**

Keywords: solar energy **and** solar power

Write down two articles that you would use for your assignment. Provide the following information: author, date of publication, article title, journal title, volume, issue number, pages.

Article 1:_____

Article 2:_____

Exercise 3: Retrieving full text articles

Hand-in exercise

Electrotechnology 1

Name and surname: _____
Student number: _____
Group: _____
Date: _____

Activity 4: Retrieving a full text article

You have retrieved the article below via the Engineering Village database. You are able to view the abstract but there is no full text link.

ARTICLE DETAILS:

Design and analysis of solar thermoelectric power generation system
Vatcharasathien, Narong; Hirunlabh, Jongjit; Khedari, Joseph; Daguenet, Michel
Source: *International Journal of Sustainable Energy*, v 24, n 3, September, 2005, p 115-127

Which database would you use to retrieve the full text article?

Answer: _____

CPUT's homepage is: http://www.cput.ac.za

Complete the steps indicating how you have retrieved the article in full text:

Step 1: http://www.cput.ac.za

Step 2: Click on Library … continue by completing steps 3-7)

Step 3: Click on _____

Step 4: Type: _____ then **enter** or click on search

Step 5: Click on _____

Step 6: Click on _____

Step 7: Click on _____

Step 8: Click on the PDF Full Text (764K) link to retrieve the full article.

Exercise 4: Referencing

Hand-in exercise

Electrotechnology 1

Name and surname: _____
Student number: _____
Group: _____
Date: _____

Activity 5: Harvard Citation Referencing Style

Reference the attached items according to the Harvard Citation referencing style.

Photocopied record: 1 is a book
Photocopied record: 2 is a print journal article
Source an e-journal: 3 is an electronic journal article

Record: 1

_____
_____
_____

Record: 2

_____
_____
_____

Record: 3

_____
_____
_____

APPENDIX E

ACRL STANDARDS SELECTED FOR THE INTERVENTION

Standards, Performance Indicators, and Outcomes

Standard One

The information literate student determines the nature and extent of the information needed.

Performance Indicators:

2. The information literate student identifies a variety of types and formats of potential sources for information.

   Outcomes Include:

   c. Identifies the value and differences of potential resources in a variety of formats (e.g., multimedia, database, website, data set, audio/visual, book)

   d. Identifies the purpose and audience of potential resources (e.g., popular vs. scholarly, current vs. historical)

Standard Two

The information literate student accesses needed information effectively and efficiently.

Performance Indicators:

1. The information literate student selects the most appropriate investigative methods or information retrieval systems for accessing the needed information.

   Outcomes Include:

   c. Investigates the scope, content, and organization of information retrieval systems

   d. Selects efficient and effective approaches for accessing the information needed from the investigative method or information retrieval system

2. The information literate student constructs and implements effectively-designed search strategies.

   Outcomes Include:

   b. Identifies keywords, synonyms and related terms for the information needed

c. Selects controlled vocabulary specific to the discipline or information retrieval source

d. Constructs a search strategy using appropriate commands for the information retrieval system selected (e.g., Boolean operators, truncation, and proximity for search engines; internal organizers such as indexes for books)

5. The information literate student extracts, records, and manages the information and its sources.

Outcomes Include:

c. Differentiates between the types of sources cited and understands the elements and correct syntax of a citation for a wide range of resources

Standard Five

The information literate student understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally.

Performance Indicators:

2. The information literate student follows laws, regulations, institutional policies, and etiquette related to the access and use of information resources.

Outcomes Include:

f. Demonstrates an understanding of what constitutes plagiarism and does not represent work attributable to others as his/her own

3. The information literate student acknowledges the use of information sources in communicating the product or performance.

Outcomes Include:

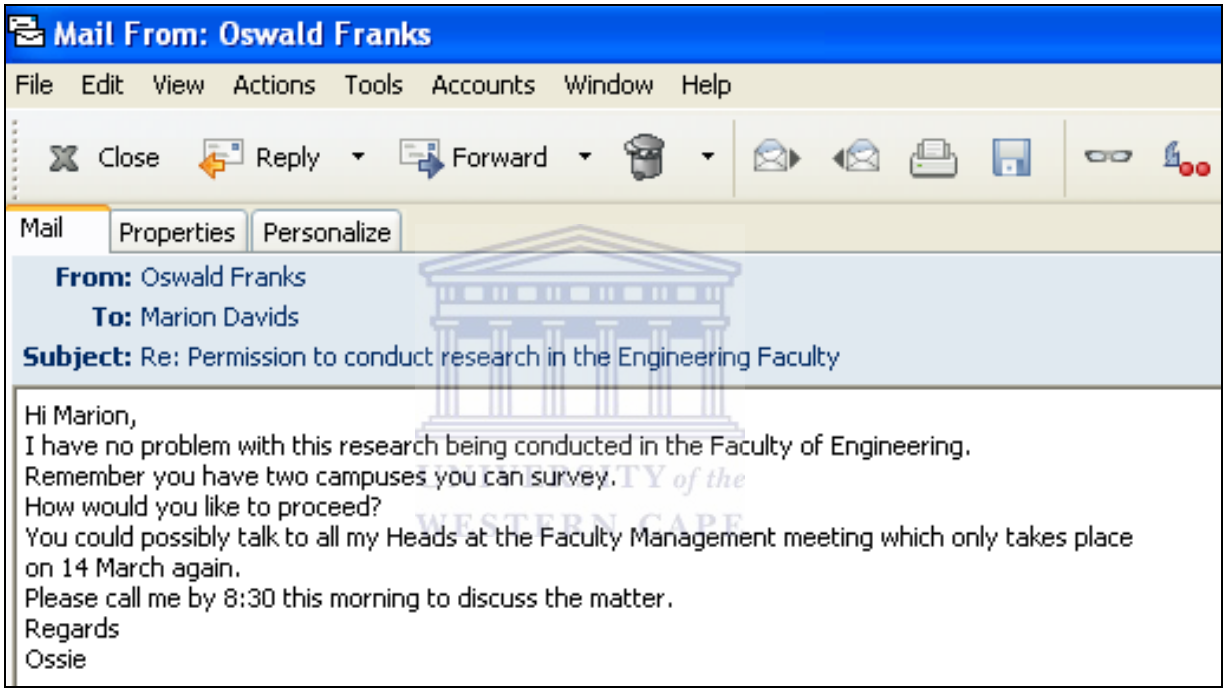
a. Selects an appropriate documentation style and uses it consistently to cite sources

APPENDIX F

PERMISSION TO CONDUCT THE STUDY AT

CAPE PENINSULA UNIVERSITY OF TECHNOLOGY

Cape Peninsula
University of Technology



Mail From: Oswald Franks

File Edit View Actions Tools Accounts Window Help

Close Reply Forward

Mail Properties Personalize

From: Oswald Franks

To: Marion Davids

Subject: Re: Permission to conduct research in the Engineering Faculty

Hi Marion,
I have no problem with this research being conducted in the Faculty of Engineering.
Remember you have two campuses you can survey.
How would you like to proceed?
You could possibly talk to all my Heads at the Faculty Management meeting which only takes place on 14 March again.
Please call me by 8:30 this morning to discuss the matter.
Regards
Ossie