

**TOWARDS THE ESTABLISHMENT OF AN ENTREPRENEURIAL
CULTURE AT EASTERN CAPE TECHNIKON: A STRATEGY WITHIN THE
DEPARTMENT OF ELECTRICAL ENGINEERING**

**A RESEARCH DISSERTATION SUBMITTED TO DURBAN INSTITUTE OF
TECHNOLOGY IN PARTIAL FULFILLMENT OF THE DEGREE OF
MASTER OF TECHNOLOGY: ENTREPRENEURSHIP**

BY: MLUNGISI MARTIN SITSHINGA

ND (Elect. Eng); NHD (Elect. Eng); M Dip Tech (Elect. Eng); MBA

**SUPERVISOR: DR C van WYK, EASTERN CAPE TECHNIKON, SA
B Com; BED; MED; DED; DIP:THED**

**CO-SUPERVISOR: PROF D JENKINS, COVENTRY UNIVERSITY, UK
MA DIP; FRSA**

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PREFACE

The work described in this dissertation/thesis was carried out by the author in the Faculty of Commerce, Durban Institute of Technology, from 2001 to 2002 under the supervision of Dr. C. Van Wyk and Prof D Jenkins. These studies represent original work by the author and have not been submitted in any form to another Tertiary Institution. Where use is made of the work of others, it has been duly acknowledged in the text.

Signature

13 January 2004

Date

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ABSTRACT

The study examined the perceptions of the Eastern Cape Technikon (ECT) Department of Electrical Engineering (DEE) learners on entrepreneurship education as part of their curriculum, their learning styles and learning approaches. This was important in order for the researcher to devise teaching approaches and materials that would suit their learning styles and approaches. The study was therefore based on the assumption that changing from traditional to innovative learning and teaching approaches would motivate and better prepare learners to become entrepreneurs.

Data collection techniques involved interviews which were subsequently verified by questionnaires administered to different groups of learners called the focus group, the comparison group and the entrepreneurship-training candidates. Interviews were also conducted amongst Government Ministers, Senior Government Officials and the Chief Executive Officer of a non-grid concession area in the Amatola District Council (DC12) and Oliver Reginald (OR) Tambo, EC 157 municipalities.

The results showed that the majority of learners preferred entrepreneurship education as part of the DEE curriculum. The results also showed that the majority of learners have preferences for reflectors and pragmatists learning styles. Subsequently, the study proved that a change from traditional to innovative learning styles and teaching approaches would promote entrepreneurial spirit among the learners.

It was therefore recommended that the Eastern Cape Technikon should introduce entrepreneurship education as part of the curriculum in the Department of Electrical Engineering (DEE) and that teachers should encourage and motivate learners to realise entrepreneurship as a career choice. It was also recommended that all teachers should always conduct an assessment of learner's learning styles if they are to design teaching approaches that will meet the preferred learning styles. Finally, teachers are implored to solicit and form partnership with industries if they are to keep abreast of the latest developments in their fields. This is particularly important if lecturers are to assist learners access experiential training in entrepreneurship.

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1. CHAPTER 1: INTRODUCTION AND THE RESEARCH PROBLEM

1.1. Introduction

Unemployment, wherever it is experienced, results in poverty, crime and sometimes diseases. One of the felt effects of unemployment is an undereducated community, which further results in crime that invariably drives tourists away, thereby negatively affecting the economy of the country. Such are some of the conditions one might expect to find in the Eastern Cape Province of South Africa, a predominantly rural and one of the provinces reported to have high unemployment levels in the country. This is the province, which is home to \pm seventy-five percent (75%) of the learners attracted to the Eastern Cape Technikon (ECT).

In an effort to alleviate this state of unemployment in the country, the government mandated schools and tertiary institutions to offer entrepreneurship education as part of their curriculum. However, there seemed to be little evidence of the implementation of this mandate at ECT, particularly in the Department of Electrical Engineering (DEE).

As an attempt to respond to the Government's mandate, the study was aimed at changing from traditional to innovative teaching and learning approaches that would help produce graduates with an entrepreneurial spirit at ECT's DEE. One of the strategies to achieve this goal was through collaborative activities involving government, commerce, industry and the community. It was hoped that in this way learners could be encouraged to become entrepreneurs with the ability to create employment opportunities for the inhabitants of this province. The collaboration envisioned would involve graduates from the ECT in being trained to provide renewable energy in the Amatola District Council (DC) 12 and the Oliver Reginald (OR) Tambo Municipality District EC 157, an area where more than 50,000 rural homes lack access to electricity. The renewable energy technology project – scheduled to last for twenty years – is targeted at providing entrepreneurship opportunities to no less than 1208 graduates from the Technikon, who will be expected to set up fuel cell recharge and maintenance centres for every 250 electrified homes. Local women would be employed to wire electrical harnesses, while local men would assist in the installation and maintenance of the supplied systems. This would be a rotating job

where each family interested in the project would have an opportunity to work for a few hours and earn a salary for the work done. In this way more jobs would be created for local women and men during the project installation period.

1.2. The Problem Statement

The problem of unemployment became evident after the birth of the new dispensation in South Africa when homelands like Transkei and Ciskei became an integral part of Eastern Cape Province. These changes affected the socio-economic viability of erstwhile independent homelands, in that government incentives to provide for employment opportunities were subsequently withdrawn. The withdrawal leads to fewer children being sent and admitted to tertiary education, because of the associated costs.

The severity of the problem will further become eminent when estimates that, by 2010, there may be more than 8 million unemployed people are realised. A shortage of 200, 000 skilled workers and that many graduates will be unemployed, and under-employment will increase by 2010 are some of the anticipated results (Gouws, 1997:143). This poses a threat for the Eastern Cape as according statistical reports for 1998 and 2000 showed that this province experienced the highest (48%) and second highest (30%) unemployment levels respectively (Gouws ,1997:144).

In order to make a contribution to employment in the country, the government mandated schools and tertiary institutions to offer entrepreneurship education as part of their curriculum. It is therefore the aim of this study to investigate and establish strategies to encourage and offer entrepreneurial education in line with the government's mandate.

1.3. Eastern Cape Technikon Profile

The problem cited above was analysed in terms of the province's, especially Transkei's political, socio-economical and technological factors as follows:

1.3.1. The Political Situation

The ECT is situated in the Transkei region of the Eastern Cape Province, the second largest province in South Africa, that also has a predominantly rural population and part of the unemployment levels referred to above. As already indicated, unemployment in this province became evident after the 1994 political changes in South Africa. The changes saw the collapse of homelands and previous regimes into one integrated country.

Industries under the old regimes used to enjoy subsidies, which were purported to offer job opportunities for its communities. These subsidies have since been withdrawn, resulting in mass retrenchments or total closure of industries particularly in Butterworth, a town where ECT's main campus is situated. This town, one of the industrial centres of the former Transkei homeland, has been affected by the closure of the industries.

1.3.2. Social Situation

On average, 75% of learners aged 19 attracted to ECT come from Transkei, a region that has been reported to lack employment and disadvantaged environment that are not conducive to their being masters of their own destinies. These learners are estimated to constitute 42% (Table 1-1) of the total population that come from Transkei's municipal areas such as Mbashe (EC121) and OR Tambo (EC157) (SA Explorer, 2002). These municipality areas experience unemployment levels as high as 51% (Table 1-2).

Table 1-1: Age Breakdown

(SA Explorer, 2002)

Age Breakdown	EC 121	EC157	Total	% Total
0-4 yrs	35272	55543	90815	14%
4-19 yrs	108304	163590	271894	42%
20-29 yrs	27571	61186	88757	14%
30-49 yrs	33650	64710	98360	15%
50-64 yrs	20534	26988	47522	7%
Over 65 yrs	16815	19325	36140	6%
Age Unknown	2003	4567	6570	1%
Total	244149	395909	640058	100%

Table 1-2: Employment Levels at EC 121 & 157

(SA Explorer, 2002)

Status	EC 121	EC 157	Sub-Total	% Total
Employed	10311	42601	52912	41%
Unemployed	23529	42884	66413	51%
Employment Unspecified	188	315	503	0%
Other	308	9910	10218	8%
Total	34336	95710	130046	100%

1.3.3. Technological Status

The learners coming from the above environment are to a very large extent, under-prepared and ill equipped for tertiary education, especially technology-oriented education. As a result of the withdrawal of most industries, the Transkei region is technologically dependent on nearby cities such as East London, with its major industries such as Daimler Chrysler, and Port Elizabeth with, its Volkswagen manufacturing plant. Despite the fact that ECT has three Faculties, broken down into fourteen Departments, which offer programmes in Engineering, Business Sciences, Education and Applied Technology, and a constant student growth as shown on Figure 1-1, graduates still have to move to the above cities for employment opportunities.

According to the situational analysis on the institution, as well as the skills audit conducted on the general ECT teachers, including the researcher, it was found that most (about 75%) of these lecturers are inexperienced to teaching as many of them joined the institution straight from the higher education system and/or the industry. These lecturers, unfortunately, do not have the required skills for performance-based education (Harvey, 2001:235). This does not augur well for ECT, an institution that is faced with the challenges to produce graduates who are expected to improve not only the socio-economic conditions, but use their qualifications to promote technological advancement in the province.

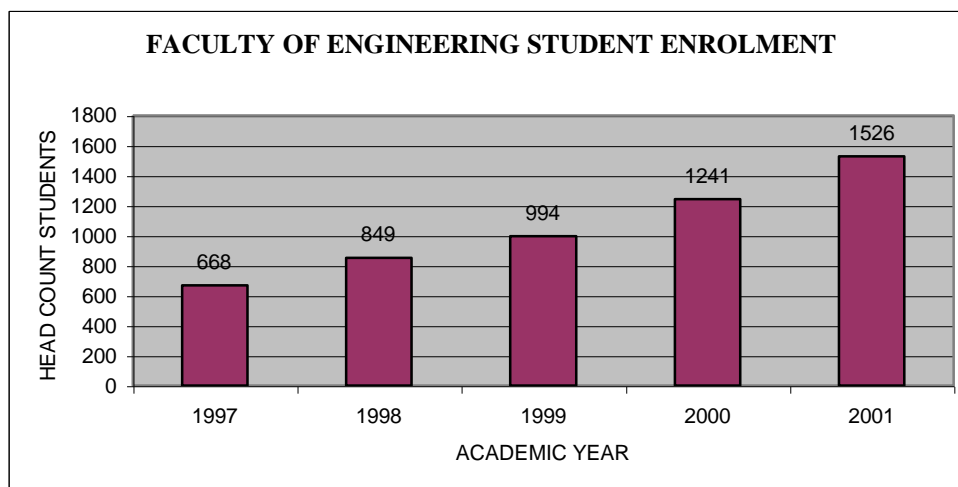


Figure 1-1: Faculty Of Engineering Student Enrolment

It is envisaged that courses offered by the faculty of engineering such as building (BUI), civil engineering, electrical (ELECT) and mechanical (MECH) engineering should equip and encourage ECT learners to set up their own businesses.

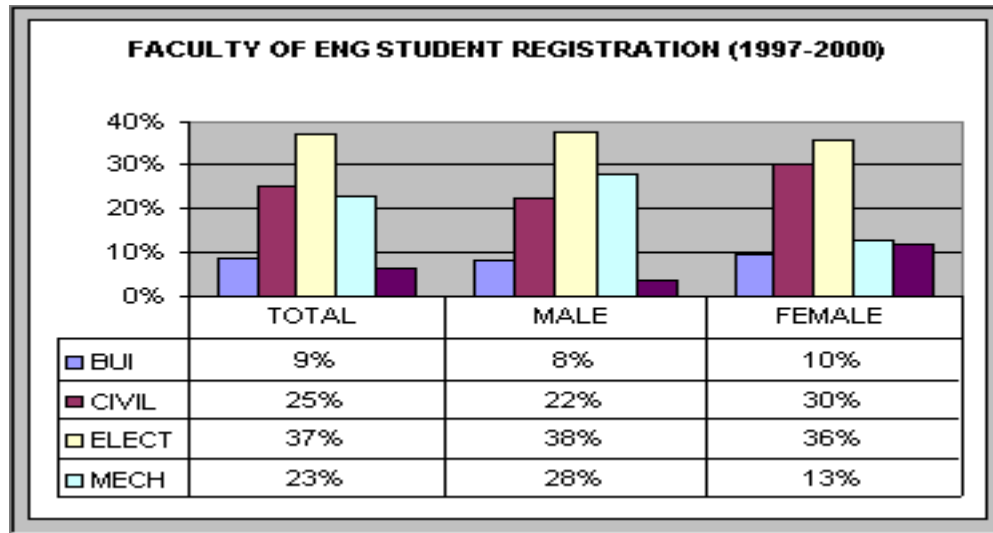


Figure 1-2: Student Enrolment Per Academic Department

It is however noted that, although the faculty has so far enjoyed a steady increase in student intake (Figure 1-2), with the DEE, at which this study is targeted enjoying higher enrolments than its sister departments, none of these learners are reported to have set up their own businesses after graduating from ECT.

Table 1-3: Energy Usage in EC 121 and EC 157

(SA Explorer, 2002)

	EC 121	EC 157	Total	% Total
Local Authority	1757	16756	18513	14%
Other	289	410	699	1%
Gas	266	577	843	1%
Paraffin	38270	37797	76067	59%
Candles	7743	24033	31776	25%
Electricity Other Source	1	4	5	0%
Electricity Unspecified	477	1093	1570	1%
Total	48803	80670	129473	100%

A look at energy used in the areas of EC 121 and EC 157 shows that 59% of the people use paraffin and 25% candles, only 1% use electricity. It is argued that learners from ECT should use

the provision of electricity based on the latest technology such as renewable energy as a competitive advantage to enter the business. This is because this form of energy is healthier, cleaner and safer and is sometimes more cost effective than paraffin and other forms of energy.

1.4. Delimitation

As a case study and to exploit the above competitive advantage, semester 4 (S4) learners in the electrical protection subject in the DEE, hereafter called the focus group, were used to test the effect of changing to teaching and learning that would promote entrepreneurship among them. These are the learners who as already alluded to, generally come from Transkei and were enrolled in heavy current, a stream within the DEE. This is the stream that is concerned with the generation, transmission and distribution of low voltage (220/400 Volts) to high voltages (750 000 Volts) and then stepped down to 220/400 for application by consumers. A second group of S4 learners, hereafter called the comparison group, was used to compare data generated from the focus group. This group also constitutes final year learners in the DEE, but who take different subjects offered by different lecturers and are about to enter the market as job seekers. A third group called entrepreneurship training candidates was included. This group consists of and limited to learners who had completed their academic theory and practical training towards their diploma qualification and are ready to join the entrepreneurship programme proposed in this study.

1.5. Importance Of The Study

It is important to realise that teaching and learning that promote entrepreneurship among ECT learners could invariably meet the challenge of turning graduates into entrepreneurs rather than job seekers. Gouws (1997: 147) argues that the youth must be exposed to and prepared to survive in the changing world of work. For this reason, there arose a need for ECT to adopt an entrepreneurial approach if it is to participate successfully in the education system of the country that will:

- a) Create job opportunities.
- b) Initiate the production process.

- c) Harness and develop natural resources.
- d) Generate wealth and a high standard of living.

The graduates produced from ECT can as well contribute as stipulated above by setting up small, micro and medium enterprises (SMMEs). SMME's contributions throughout the world have been found to play a crucial role in absorbing labour, penetrating new markets and generally expanding economies in creative and innovative ways. SMMEs often provide a vehicle for the lowest-income people to gain access to economic opportunities (Ngombane, 2002:1). To this end, SMMEs represent 97,5% of the total number of business firms in South Africa that contribute 34.8 % of the GDP, employ 55% of the country's labour force and contribute approximately 42% to total remuneration. The gross value added by SMMEs per sector is the largest in construction and trade whilst they contribute the least in electricity, gas and water (0%) and mining (5%) (Ntsika Enterprise, 2000:35).

1.6. Assumption

This study was based on the assumption that changing from traditional teaching and learning to an innovative approach at ECT, would better prepare the learners as future entrepreneurs.

1.7. The Goal Of The Study

The assumption made above required the researcher to investigate whether changing from traditional teaching and learning to innovative approaches would promote an entrepreneurial culture at ECT. This was done in anticipation that the change would help generate graduates with an entrepreneurial spirit who can, in turn, establish their own enterprises that will reduce unemployment levels in the province. In particular, the research sought to answer the following action research questions:

- a) What entrepreneurship perceptions do learners at ECT possess?
- b) What learning styles do learners possess and what learning and teaching approaches would promote entrepreneurship among these learners?
- c) How can learners and graduates be exposed to an entrepreneurship environment?

Underlying these research questions were the following action research objectives:

- i. To establish the extent to which learners perceive entrepreneurship education as part of the DEE curriculum.
- ii. To identify learning styles, learning and teaching approaches that promote entrepreneurship;
- iii. To investigate strategies that will expose learners to entrepreneurial training.

1.8. Previous And Current Practices: A Literature Review

In order to realise the above goals an action research as a research design method was considered. According to Wickham & Bailey (2000:13) research design, such as action research, can incorporate literature review as part of a report in one of two ways: either as a separate section under a dedicated heading or in the different sections of the report. In this study, literature forms an integral part of the chapters and will be dealt with accordingly.

Literature reviewed was directed at entrepreneurship education as the main thrust of the research hinges around emancipation from unemployment in the province. It was therefore necessary to understand what entrepreneurship means with respect to this study. Entrepreneurship is sometimes equated only with starting a small business. While new venture creation is the most prevalent form of entrepreneurship, it is not the only form (Kent, 1996:1). For this reason, the definition of entrepreneurship as submitted by Timmons (1990) in Takyi-Asiedu and Asomaning (2001:17) was contemplated. These authors define entrepreneurship as:

the process of creating and building something of value from virtually nothing. It is seizing and pursuing an opportunity, initiating and building an enterprise or organisation rather than just watching, analysing or describing one. It involves a team of people with complementary skills and talents. It involves the ability to find, marshal and control resources (often owned by others) and to ensure that you do not run out of money when you need it most. Finally, it is the willingness to take calculated risks, both personally and financially, and then do everything to influence the odds.

Sexton and Kasarda (1992:58) on the other hand define entrepreneurship as:

the process of uncovering or developing an opportunity to create value through innovation and seizing that opportunity without regard to either resources (human and capital) or the location of the entrepreneur in a new or existing company.

From these definitions, one could deduce that entrepreneurship rests on aspects such as opportunity identification and creation of an enterprise. Other common characteristics that emerged out of the definitions are risk taking, capital and human resources. A combination of these three elements point to what Bygrave (1994:10) refers to as the three driving forces leading to entrepreneurship.

Experiences and lessons learnt from other institutions and organisations both locally and internationally were a telling trade-off between local events and global relevance in as far as an entrepreneurship culture is concerned. Culture is what generally reflects the values of the founder(s) and the mission of the organisation. In this study, entrepreneurship culture is regarded as part of an organisation's culture, which is the collection of beliefs, expectations, and values shared by a corporation's members and transmitted from one generation to another (Wheelen & Hunger, 1998:89). This is the way of doing and being of a company; it is a variable like satisfaction or motivation. These variables can be measured and are subject to change and manipulation (Chell, 2001:12).

Similarly, it is considered that ECT's culture towards entrepreneurship can be changed; therefore it is important that management, leadership and other employees effect the desired changes. In this regard, the production of graduates with an entrepreneurial spirit, as part of ECT's mission statement, formed the basis for determining how appropriate learning and teaching strategies as a vehicle to promote this spirit at ECT are.

This is the approach that was adopted by countries such as the United States of America (USA) and much of the Western world, when they experienced a dramatic transformation from a corporate-bureaucratic to an entrepreneurial driven economy in the 80's. The transformation saw over 4 million workers being eliminated. However, the total employment at that time expanded to more than 20 million workers (Sexton & Kasarda, 1992:1). Accordingly, academics and practitioners alike recognised the breadth and nature of the research which guided them in the promotion of the awareness, the teaching, and the understanding of the field of entrepreneurship. This new wave of business development had as much to do with changes in values, perception, attitudes, and demographics as it did with economic and technological events.

In the same breath and as submitted by Brockhams (1992:4), teachers in South Africa will have to relinquish their traditional approach to education if they are to participate successfully in entrepreneurship education. The implication is that, entrepreneurs cannot be trained by traditional methods, which means, South Africa has to solicit alternative approaches to teaching and learning if it has to aim for global competitiveness. Arguments by Brockhams (1992: 4) seem to further support the view that the traditional approach to teaching tends to be teacher and content driven with emphasis on format evaluation. Jesenberger (2002:1) argues "we still teach our children in the same way as we were brought up, to learn a profession, to work a full life, to receive promotions from time to time and then finally retire at the age of 65 as honourable parents". Bitzer (2002:16) identifies why learning and teaching are still relatively limited in higher education. The author also makes suggestions on areas of innovation and learning, one of which and in line with the spirit of the study, is to increase experimentation with community-directed and research related learning of action and development research. Learning programmes must be directed at alleviating societal problems that are conceptually relevant and learning in cooperation with society.

In order to achieve the above objective, the study was focused on student needs, the approach of teaching, the format, and the different outcomes. Focus and comparison groups formed part of the study so that those that received the intervention could be compared with those who did not. The intervention composed pre and post evaluation.

It was therefore important to conduct study of the following institutions and organisations, particularly in other parts of the world, where innovative learning and teaching strategies that promote entrepreneurship are being practiced.

a) The Netherlands Government Funded Project

The project called Pii-project was based on the following five elements (Buijs, 2002:7):

- i. A simple stage-gate model of innovative process in which the model starts with the strategic analysis of the company and its competitive environment.

- ii. A process oriented consulting style aimed at stimulating their clients to learn to solve their own problems.
- iii. A multi-disciplinary approach to form the basis of the innovative learning process.
- iv. Use of creative techniques like brainstorming and lateral thinking for a positive creative climate.
- v. The stimulation of the use of external information as the companies' answers to changing elements in the competitive environment of the company.

The overall intention of the course is to show that it is possible to change non-innovative and non-creative companies into creative innovative companies.

b) Management Institute Of The University Mittweidae

The principle of education through practical experience rather than classroom studies at the Management Institute of the University Mittweidae is the reason it receives funding from industry to finance the innovation programme (Jesenberger, 2002:12). The funding is generated by using the university premises and facilities at a favourable price. Jesenberger above suggests that in future universities will compete with enterprises for educational programs and training courses and visa versa. Both will have to search for new ways to share the responsibility to train the learners and offer continuing education as well as adult education.

The university offers modules that are targeted at critical thinking, where graduates are put in a position where they can judge correctly and critically before wasting time and money. The way in which mutual understanding and comprehension can be practiced is an integral part of their module. Other modules use the creation of a theatre scene to strengthen and refine human expressiveness in order to gain harmony and balance between thinking, feeling and will. All the modules aim to create an innovative climate in the training, teaching and educational methodology.

c) University Of Ghana

Takyi-Asiedu & Asomaning (2001:20) of the University of Ghana argue that entrepreneurship education provides people with the need for achievement; therefore it must be designed to cultivate the capacity for creative thinking, the willingness to accept challenge and the courage to act with ethical standards and commitment to responsibility. This institution believes that entrepreneurship education in most parts of the world covers areas including, but not limited to, opportunity identification and evaluation, entrepreneurial potential assessment, business plan preparation and evaluation and resource mobilisation, business skills development as well as venture creation and operations.

In conclusion, the above lessons were used as part of the observation and reflection on the status of entrepreneurship culture, and frameworks upon which to formulate strategies to establish entrepreneurship culture at ECT.

1.9. Summary

- a. This chapter, dealt with the introduction of the study, problem statement, profile of the Eastern Cape Technikon and delimitation of the study. The chapter further dealt with importance of the study, an assumption made about the problem and a brief discussion on previous and current practices based on the literature reviewed. The remaining chapters will be as follows:
- b. Chapter two presents the research design and data collecting techniques. The chosen research methodology together with its justification is presented.
- c. Chapter three deals with the results of the research and the discussion of the results. The results in respect of each cycle of the project are first presented, and then followed by detailed discussion of the results obtained. This chapter deals with the observations made and a reflection deduced from the data collected and interpretation using literature review.
- d. Chapter four focuses on the conclusion and the recommendations based on the findings of the study.

2 CHAPTER 2: RESEARCH DESIGN AND METHODOLOGY

2.1. Introduction

In this chapter the methods and data collection techniques to establish research objectives in chapter one are investigated and presented. The chapter also recounts the reasons for choosing the methodology of action research and the approaches used.

This is a case study conducted in the researcher's subject of electrical protection at ECT's DEE. This is the department where the researcher teaches. For this reason, the subject was chosen because of the convenience in terms of accessing learners, the control and time allocated for this purpose. The case study involves research and acting on the results obtained. Results were also applied in the identified teaching strategies. Finally, and as a result of the research, the study provides collaboration where learners from the DEE called entrepreneurship-training candidates have completed electrical practices one (P1) and two (P2) and are ready to be trained under the project as entrepreneurs. This is a prototype project designed to examine whether changing teaching and learning styles would be able to produce entrepreneurs.

2.2. Research Methodologies

As assumed in chapter one, in order to establish an entrepreneurship culture at ECT, changes from traditional to innovative learning and teaching approaches for entrepreneurship were essential. This meant changes relating to teaching and learning approaches could only be effected in collaboration with the learners. An action learning research approach to teaching can be used to improve teaching and learning practice (Riding, Fowell and Levy, 2002). Further, changes in the current curriculum to include elements of entrepreneurship involved a process of consultation and collaboration with other stakeholders such as the departmental board, the faculty board comprised of all the departments in the faculty and the management of ECT. Finally, to test whether the changes implemented can operate in real work situation required collaboration and agreement with an industry partner, where entrepreneurship training could be provided.

Given these circumstances, action research as a methodology was considered because there were three essential features, which were present for an activity to be legitimately developed as an action-research programme. These were:

- a) The project took place as a social practice in the form of a strategic action susceptible to improvement: that is, changing from traditional form of learning and teaching to those that are innovative.
- b) The activities were conducted in a way which involved other participants, such as the learners, academic staff, management and the industry partner. The emphasis was on action learning, not just the taking of action.
- c) The project proceeded through a spiral of cycles of planning, acting, observing and reflecting. Each of these activities was systematically and self-critically implemented and interrelated as suggested by Carr and Kemmis in Kember and Kelly (1993:20). The action research cycles are presented in Figure 2-1 below.

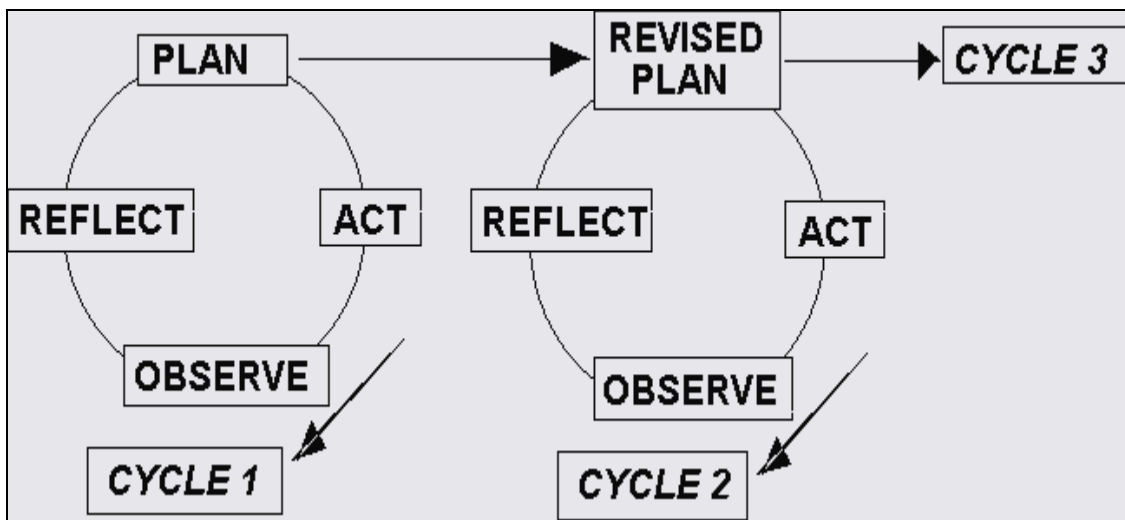


Figure 2-1: Action Research Cycles

(Dick, 2001)

Furthermore, and as submitted by Dick (2001), there are cycles within cycles, which can be used as interviews for data collection. The cycles or spirals are presented as follows:

- a) Initial reflection arose out of the problem of unemployment in the Eastern Cape, which was seen as a threat to learners and subsequently affects learning at ECT. As part of the initial reflection, literature on previous and current practices on how entrepreneurship

was established in other areas was presented in chapter one.

- b) Plans were made to change to teaching and learning approaches that would promote entrepreneurship among the focus group. An entrepreneurial learning and teaching approach was tested. The plan included a decision on which questions to answer, who should ask them and how, as well as how to implement the revised strategies.
- c) Action research took place when innovative learning and teaching approaches were introduced into the class. Learners were exposed to a number of classroom and fieldwork activities such as a project to analyse power system failure at the student village on Butterworth campus, site visits, simulations and related activities.
- d) There was detailed observation, monitoring and recording to evaluate the effectiveness of the intervention. Data collection techniques used were:
 - i. Feedback received from the learners
 - ii. Diagnostic devices designed and implemented
 - iii. Records of the action produced and studied
 - iv. Observations and interviews were used to explore learners' reactions to this form of learning in comparison to lecture-based teaching.
- e) After each observation, reflection was carried out on what had happened, how effective the changes were, what the researcher and the participants had learnt from the feedback, what barriers were experienced to change and how to improve on the changes participants wanted to achieve.

After reflecting on the results of the analysis of the three-phase action cycle, the next cycle involved inviting learners from DEE to apply and receive entrepreneurship experiential learning under a joint venture between ECT and Renewable Energy Africa (REA). These recurrent cycles of the three phases form the action research spiral. The knowledge from one cycle informs the strategic action of the next cycle (Nduna, 2000:79). To attend to the stated objectives, details of data collection techniques are presented below.

2.3. Data Collection Techniques

2.3.1. Introduction

While making use of techniques which are common to many forms of qualitative inquiry, action research is not distinguished by particular methods of data collection, but is characterised by a methodical process which is quite different from other methodologies (Nduna, 2000:88). Dick (2001) submits that much of the literature on action research does not explain in detail how it might be done. However, she suggests that the most commonly used methods for data collection are interviewing and focus group. Mc Niff, Lomax and Whitehead (1996: 86) recommend, that research should include a diary or journal, observation, questionnaires, interviews, photographs, tape recording and video as data collection techniques. Wickham and Bailey (2000:16) add test and examinations results, workshops, learner writing, and a variety of school records. This is also in line with Elliot in Nduna, (2000:89) who states that the action researcher should make use of a wide range of monitoring techniques because multi-techniques will help to secure a more penetrating grasp of the situation.

For the purpose of this study, data collecting techniques presented in Figure 2-1 below designed by Kember and Kelly (1993:12) were found to be suitable. They were used in this study as they encompass most of the techniques recommended by the authors discussed above.

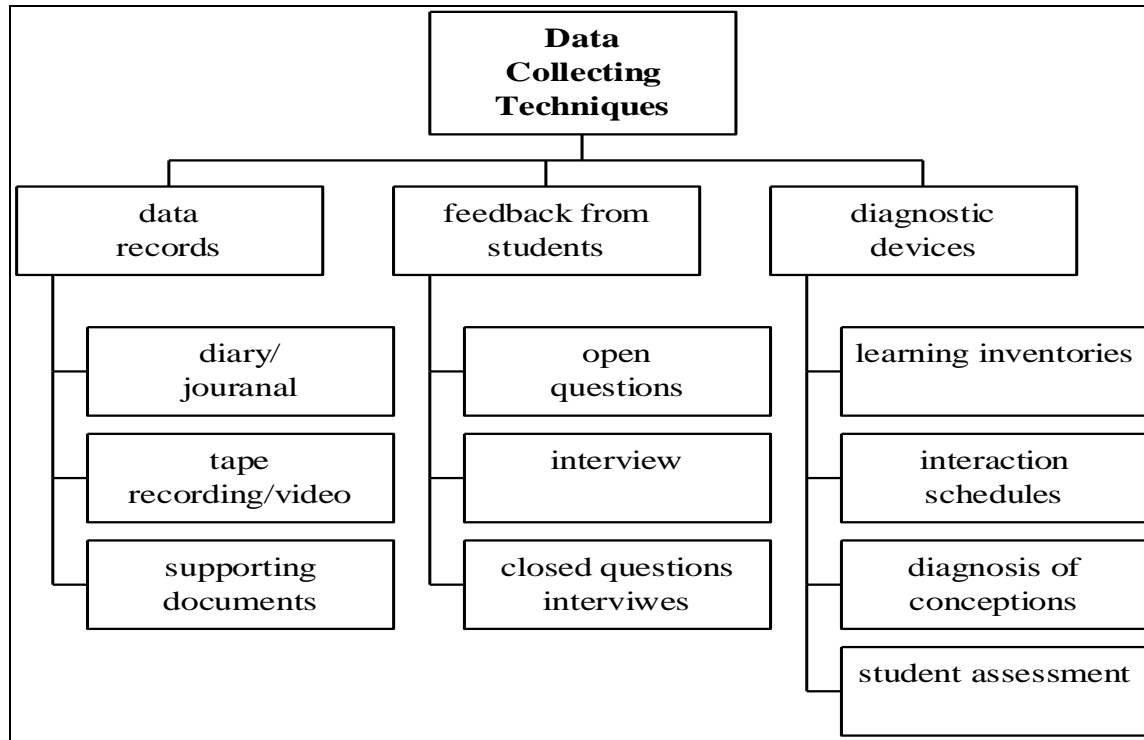


Figure 2-2: Techniques for Observation

(Kember and Kelly, 1993:12).

Details of data collecting techniques and how they were applied in the study are presented below.

2.3.1.1. Data Records

a) Diary and journal

As part of the study, diaries were kept and used to record thoughts and feelings about daily events that took place in each of the campuses during class contacts. Raw data was entered into the dairies and subjected to analysis. A sample diary is presented in Annexure 3-1. Further data included in the diaries were records in respect of contact periods, plans made, records of attendance, observations of the effects of the actions, impressions and personal opinions about the action taken and the results obtained from observations.

b) Video Recording

A video recording machine was used to collect detailed recording of presentations and discussions during the signing of a collaborative agreement held on 14 November 2002 (Annexure 3-8). On this day, ECT and REA agreed to use the project awarded to the latter in the Eastern Cape District Municipality of Amatola DC 12 and OR Tambo EC 157. The meeting was attended by stakeholders such as, the government (Office of the Premier), the Amatola DC 12 representative, the Technology and Human Resources for Industry Programme (THRIP) officials, the Rectorate, the Dean of the Faculty, ECT academic staff and learner representatives. Detailed discussions on the project are presented in chapter three.

c) Supporting Documents

Copies of the study guides were handed out and discussed with the focus group. Details such as the lecturer's office, dates of tests, assignments, site visits and other issues were presented and, where necessary, agreed upon participatively (Annexure 3-2). The list of tests and examinations results was also kept. Minutes of the departmental board, particularly on the proposal to include entrepreneurship as part of the curriculum, were kept.

Details of the non-grid service provider collected from the Office of the Premier of the Eastern Cape Province led to writing an electronic mail, which was responded to as reflected in Annexure 3-4. This correspondence resulted in a series of meetings that led to an agreement where ECT learners would use the electrification project covering municipality district council called Amatola DC 12 and OR Tambo EC 157 municipality district (Annexure 3-6) as a work-based project for entrepreneurship experiential learning.

2.3.1.2. Feedback From The Stakeholders: Interviews And Questionnaires

a) Interviews

Interviews ranging from fully structured to semi-structured were used in a variety of enquiries in this study. Fully structured interviews, in the form of face-to-face interviews, were used to ask questions put to the respondents. The aim was to ask exactly the same questions, in the same order and style of delivery, to all learners in the focus group at both campuses. A semi-structured interview has a starting point and an objective but no set agenda.

Interviews, whenever used, provided more opportunity for the respondents to raise their own issues and concerns, but could be more time consuming and raise difficulties in the collation and interpretation of information (Kember and Kelly, 1993:15). Melville and Goddard (1996:44) supports the view that while interviews can clarify answers and enable one to follow up interesting answers, they are time consuming, particularly when dealing with a large number of respondents. For this reason, the interviews were, where necessary, followed up by a questionnaire. Semi-structured interviews were primarily used in cases where learners were not involved e.g. meeting with officials and the Minister of a government department. In these interviews, one was free to pursue issues of importance raised by the interviewee which could be used for the study. The method was used because, in interviewing government officials, important issues may arise which would need to be followed up.

In order to gain insight on how the focus group perceived entrepreneurship education, 40 learners were asked the question: “What would you like to become after completing your studies”? This was used to find out how the learners take information and process it as people tend to view the world in a way that makes the most sense to them as individuals. The way people view the world is called perception. Perceptions shape what people think, how people make decisions, and how they define what’s important them. Individual perceptions also determine people’s natural learning strengths, or learning styles.

Upon observing that none of the learners referred to entrepreneurship as a career choice, a

follow-up question was asked: “Who of you would like to use his/her qualification to start a business someday?” In response, members of the focus group were able to share their views on how they felt about becoming entrepreneurs. Another interview was conducted with 41 learners from the focus group to establish how they preferred to learn and to be taught. This was prompted by the realisation that the majority of the learners avoided responding to questions during class. Learners were then asked the question “what they would prefer, given the famous Chinese proverb, “tell me I forget, show me I remember and involve me, I will understand”.

To negotiate collaboration and a forum where learners could be exposed to real entrepreneurship experiences, a series of semi-structured interviews were held between the Offices of the Prime Minister, where strategic planning is held under the auspices of the Chief Directorate. According to Cohen and Manion in Nduna (2000:90), open-structured interviews are less formal hence the interviewer is free to modify the sequence, change wording, explain questions and add to the questions. The interviewer can also probe for more specific answers to clarify and eradicate misunderstanding.

The semi-structured interviews were used to gain knowledge about the government’s policy and areas where non-grid energy, hereafter called renewable energy, would be provided in the province. The Minister of Minerals and Energy was also interviewed during a solar project commissioning in Tsolo village (Annexure 3-9). The purpose of the interview was to confirm the government’s electrification programme in the province.

Following the interviews with the Office of the Premier, telephone interviews were held between the non-grid service provider, introduced by the Chief Director from the office of the Prime Minister. The Renewable Energy Africa (REA) company will provide an opportunity for the learners to be involved in the electrification project of no less than 50,000 homes in Amatola DC 12 and OR Tambo EC 157 Municipalities of the province. Interviews were also conducted with the members of the Technikon, ranging from staff to the rectorate.

Finally, once the agreement contract between ECT and REA was concluded as reflected in Annexure 3-8, 27 learners from the DEE were interviewed for training as entrepreneurs under the

electrification project.

b) Questionnaires

A commonplace instrument for observing data beyond the physical reach of the observer is the questionnaire (Leedey, 1993:88). For this reason, the results of the interviews presented above were verified by questionnaires, used as an alternative instrument to obtain a deeper understanding of responses already obtained in the class situation. Another reason for the use of questionnaires was that they can be analysed more easily. Detailed descriptions and applications of this technique is presented below.

Structured questionnaires, which constrain the responses to a limited number chosen by the researcher, were used. These questionnaires are easy to process and evaluate and can give clear answers to specific questions. However, questionnaires are defined by the researcher, and so could completely miss the concerns of the respondents (Kember and Kelly, 1993:14). For this reason, exploratory interviews were drawn to give respondents the opportunity to raise issues. The questionnaires were completed in the presence of the researcher where any misconceptions could be identified and clarified.

The advantage of this technique is that it is the only practical approach when dealing with a large number of respondents on different campuses and in different classes. It also has an advantage over an interview in that the questionnaire can be completed at a time suitable to the researcher and the respondent may not be inhibited in answering. The questions were designed to provide an answer to the first objective of the study. The aim was to gain detailed aspects of entrepreneurship education among the focus group. The questionnaire was so designed that learners could rate (from very poor to very strong) how they perceived entrepreneurship education as part of their curriculum. The same questionnaire was administered to the comparison group and entrepreneurship-training candidates, to establish whether similar perceptions existed among them.

A total of one hundred and twenty six (126) learners, comprised of 40 learners from the focus

group, 59 learners from the comparison group and 27 from the entrepreneurship-training candidates, completed the questionnaire on Table 2-1. In this regard, learners were asked to complete the questionnaire to indicate the extent to which they agree or disagree with the given statement. Responses were in the form of a Likert scale ranging from 1= very poor to 5= very strong.

Table 2-1: Sample Questions To Assess Aspects of Entrepreneurship Education
(Sexton & Kasarda, 1992)

Learners rating of themselves on the following items, based on a five-point scale ranging from poor to very strong						
	1=very poor, 2=poor, 3=average, 4=strong, 5=very strong	1	2	3	4	5
1	Desire to start a business someday.					
2	Desire to buy a business someday or to start an entrepreneurial career					
3	Confidence in your ability to start and run a business					
4	Confidence in your ability to buy/run a business.					
5	Your knowledge level to become a successful entrepreneur.					
6	Your skill level to become a successful entrepreneur.					
7	How much more do you think you need to learn to become a successful entrepreneur?					
8	Present ability to find information and learn more about starting/buying/running your own business.					
9	Ability to evaluate yourself as a potential entrepreneur.					
10	Ability to find/identify business opportunities.					
11	Ability to evaluate new opportunities.					
12	Ability to provide services to entrepreneurs.					
13	When do you think you will start a business after graduation? (1=very soon 5= not sure)					

Another questionnaire relating to learning styles was used to enquire about what learning preferences learners may over the years, have developed. These are the learning ‘habits’ that help them benefit more from some experiences than from others. To assist learner’s awareness about their preferred styles, Table 2-2 was used to identify their learning preferences and so put them in a position to select learning experiences that suit their styles. Forty (40) learners from

the focus group were then asked to complete the questionnaire and compare the results with the general description provided in section 3.3.2.2. This served to ascertain the extent to which the description given compared with each of their understanding of the description of the respective learning styles. This was then followed by sharing the results among the groups. A similar questionnaire was administered among 33 learners from the comparison group and 27 learners from the entrepreneurship-training candidates. This was once again to ascertain whether a general trend could be drawn out of the outcomes of the different groups.

Table 2-2: A Sample Of Kolb's Learning Styles Questionnaire
(TABEISA, 2002:13-15)

No	X ✓	STATEMENT
1		I have strong beliefs about what is right and wrong, good or bad.
2		I often act without considering the possible consequence.
3		I tend to solve problems using a step-by-step approach.
4		I believe that formal procedures and policies restrict people.
5		I have a reputation of saying what I think, simply and directly.
6		I often take actions that are based on feelings are sound as those based on careful thoughts and analysis.
7		I like the sort of work where I have time for thorough preparation and implementation.
8		I regularly question people about their basic assumptions.
9		What matters most is whether something works in practice.
10		I actively seek out new experiences

In order to realise the impact of the new teaching approaches, the learners were asked to fill in the questionnaire presented on Table 2-3 below was completed by the focus group, the comparison group and the entrepreneurship-training candidates. The purpose was to ascertain whether a significant impact from the focus group on the innovative teaching approach would be shown.

Table 2-3: Traditional Vs Innovative Learning And Teaching Approaches

(Gouws, 1997)

a) Student No----- b) Campus [Butterworth] or [East London] c) Semester [1] or [2] of 200— d) Your lecturer if yes -----					
Please rate yourself on how effective was each of the following items, based on a 5-point scale ranging from					
1= very poor, 2 = poor, 3= average, 4= strong, 5 = very strong					
1		2		3	Total %
Learn from teacher only		Learn from each other		Group work	
Passive role as listeners		Learn from sharing and debating		Discussion group work	
Learn from written text		Learn by doing		Self practicing	
Learn from a framework created by the teacher		Learn by discovering		Discussion group work Self practicing Experienced-based methods	
Learn from feedback from one person		Learn from feedback from more than one person		Group work	
Learn in a well organised environment with a fixed schedule		Learn in an informal flexible environment		Group work Experience-based methods	
Learn without pressure of immediate goals		Learn under pressure to realise goals		Group work Self practicing	
Do not learn from others		Learn to learn from others		Group work	
Are afraid to make mistakes		Learn from mistakes		Group work Self practicing	
Learn from notes		Learn from solving problems		Group work Self practicing	

NB: In Table 2-3, the numbers:

1. = Traditional learning Approach
2. = Entrepreneurship Learning Approach
3. = Teaching Method

At the end of the semester, a performance evaluation of the researcher by 37 learners from the focus group was carried out in terms of Table 2-4. Performance evaluation is important because, although the idea of payment by results for teachers was abandoned long ago in South Africa, teachers are often still judged, formally or informally by their learners and colleagues, on the basis of their assessment practices (Du Pré, 2000:37). The results would assist in establishing the researcher's strengths and weakness for future improvements.

Table 2-4: Evaluation Questionnaire
(TABEISA 2001)

	1=very poor, 2=poor, 3=average, 4=good, 5=very good						
		1	2	3	4	5	Total
1	Knowledge of subject						
2	Speaking clearly and intelligibly						
3	Provides teaching aids						
4	Uses teaching aids e.g. OHP, Board etc.						
5	Enthusiastic about the subject						
6	Preparation and organization of classes						
7	Writing clearly on the board						
8	Setting clear outcomes						
9	Asking learners relevant questions						
10	Involving learners relevant questions						
11	On time for start and finish of lectures						
12	Using relevant examples						
13	Giving effective feedback to individual learners						
14	Marking and returning student work promptly						
15	Making constructive comment on student						
16	Overall assessment of teaching performance						
17	What would you like to add about my teaching style or programme in general? -----						

c) Triangulation

A technique called triangulation was also used in this study. This is not a specific technique, but is the process of comparing and justifying data from one source against that generated from another source (Kember and Kelly, 1993:18). This technique uses a different approach to confirm or disconfirm whether the other audit instruments used in the study could produce the same results as to what the learners have reported or whether the learners understood how best they learn, hence the reason why triangulation as an instrument was used. The use of more than one observation technique helps to see whether the results obtained are consistent. Dick (2001:6) has used the same technique, sometimes referred to it as the dialectic, to compare two or more sources of data in order to focus on agreements and disagreements. In this way, information that is unique, that is provided by only one person, could be discarded and only the majority interpretation would be forwarded.

In this study, the technique was used to verify whether the response obtained by interviews correlated with that obtained by means of questionnaire. This was specifically the case where interviews were conducted with the focus group.

2.3.1.3. Diagnosis Devices

a) Learning inventories

Learners' learning inventories are examples of empirically derived measuring instruments (Kember and Kelly, 1993:16). They are being highlighted because they examine the quality of learning. They were used in this study, in the form of examinations, to compare changes in the learners, relative to their performance in other subjects.

b) Interaction schedules

Interaction schedules are methods for analysing and recording what takes place during contact sessions. This technique was used to note which of the learners were actively participating.

Through this technique, it was possible to distribute learners according to their potential and ability to promote interaction amongst struggling or disagreements among the groups.

c) Diagnostic of learner conception

Kember and Kelly (1993:17) argue that a good basis for improving one's teaching is to diagnose learners' understanding of key concepts. For an example, learners from the focus group were asked the question: "As a design technician, what would you do if you were to receive a report from a community member about the power outage in your locality?" Kember and Kelly (1993:20) suggest this technique be used to assess the learner's conception of questions, which will apply to the respondent's future every-day situation. These questions cannot be answered by reproduction or by substitution into formulae. Answers are drawn from the learners in interviews or in written form.

d) Assessments

Performance of the learners was measured by tests, examinations and continuous assessment and also used to assess complex cognitive processes as well as attitudes and social skills in the design project used as a case study in this study. The class dairy, journal, test records and written examinations of how they solved the problems and the solutions reached provided valuable data for this study.

2.3.2. Data Analysis

Data analysis involves breaking up the data into manageable themes, patterns, trends and relationships (Mouton, 2001:108). The main aim of analysis in this study was to understand the various constitutive elements of data through inspection of the relationship between the concepts, constructs or variables, and to see whether there were any patterns or trends that could be identified or isolated to establish themes in the data.

Data generated by means of interviews, interaction schedules and diagnosis of conceptions was

generally recorded in summary form and read back to the participants to confirm or add any omissions that may have occurred. The summary arrived at by majority decision would be signed for and declared to be a true reflection of the discussions for the respective contact periods.

Data collected by means of questionnaires (both open and closed questionnaires) was sorted according to a sequence. For example, all ratings of 5 from the Likert scale were arranged and placed together, counted and entered into a spreadsheet for calculating the desired output. A similar method was followed, for example, in the case of learning styles, where these were arranged according to the various preferences, added together and entered into a spreadsheet for calculating. Data generated by means of a video recording machine was kept in the researcher's office for access by interested parties.

Data obtained qualitatively, for example through interviews, was verified by means of a quantitative data collection method (i.e. questionnaires in this study). This method is suggested by de Vos, Strydom, Fouché, Poggenpoel and Schunrink (1998:244) for use when qualitative interviewing is generally used to verify knowledge obtained by means of quantitative data collection. When this had occurred, data was first gathered by means of interviews during class sessions, then analysed and interpreted jointly. Further data collected by questionnaire was analysed and compared with the results of the interviews. This is an example of triangulation, described earlier in this chapter, where information that was unique or provided by fewer participants was discarded and that provided by the majority was carried forward.

Learner assessments obtained from tests, peer assessment, presentations, report writing and the results thereof, excluding examinations results, were discussed in the class before being recorded. Supporting documents, such as study guides and the syllabus, were distributed to learners on the first day of the class. These were read through, the researcher was introduced and his office and contact hours given, tests and assignments were described. Clarification was given where learners needed further details. A class leader was nominated as a link between the researcher and the class. Supporting documents, for any reasons central to the study, were used as part of the correspondence between the researcher and the author. Data received would be confirmed

with the author to ensure common understanding on the issues raised.

Once data was obtained and analysed as described, it was interpreted jointly and the results were shared among the participants. This consensual behaviour creates shared meanings and a rationale for past, current and future action. Where there were differences of interpretation, which invariably led to tension or perhaps a conflict among the learners, the researcher's intervention as a facilitator was resorted to. The is commonly called theory in use (Chell, 2001:105).

2.3.3. Validity And Reliability Of Data

Reliability of data means the measurements are consistent. This means if the same conditions (i.e. the same participants in this case) prevail, as when the data was collected, similar results should as far as practicable be reproduced (Meville and Goddard, 1996:37). The data is considered valid as the measurements are correct and the instruments (i.e. interviews, questionnaires and other instruments presented in Figure 2-1 were used for the purpose for which they were intended in the study.

2.4. Interpretation of Data

Interpretation means relating one's results and findings to existing theoretical frameworks or models and showing whether these are supported or falsified by the new interpretation. Interpretation also means taking into account rival explanations or interpretations of one's data and showing what levels of support the data provide for the preferred interpretation. For the above reasons, it is important to reiterate that the nature of the study was such that activities carried out from the beginning to the final stage of the study were participatory. Given the circumstances, and as submitted in the data analysis, interpretation of the results obtained became a joint action of the participants. In describing criteria for action research however, not all work that passes for action research met these criteria (Nduna, 2000: 76). This meant some work failed to meet all these criteria, and some action research was developed towards meeting all these criteria. By the same token, not all the work met these criteria since not all learners were present

when analysis was carried out as presented above. Neither were all participants as previously described (i.e. the focus group, comparison group, ECT and REA) were always present during some of the activities. For example, ECT and REA were never part of the classroom teaching although the focus group was represented during some discussions with REA, and when the collaborative agreement was concluded and a contract signed on 14 November 2002.

It is nevertheless submitted, as Schensul and Schensul in Nduna (2000:93) recommend, that researchers should allow enough time for full participation of the participants in data analysis, and structure the data in such a way that it enables the participants to contribute immediately to the analysis of data because of familiarity with the context. Robottom and Hart in Nduna (1993:67) support for participation in data analysis and describe a process of reporting in which the successive version of data sources is distributed among participants for verification and amendment. This is what was described as the sequence of events that took place between the researcher, the focus group, the comparison group and the entrepreneurship-training candidates. With regard to ECT and REA, analysis and interpretation was achieved via discussions and conclusion of written communication made available to affected parties.

2.5. Conclusion

It was concluded that action research as a research methodology was found to be appropriate. This was because of its characteristics of intervention into social problems, such as unemployment in the Eastern Cape Province, and the need to produce graduates with an entrepreneurial spirit, who in turn are expected to alleviate unemployment in the Eastern Cape Province, reported to rate among the highest unemployment levels in the country. The study was also participatory in that it involved the researcher, the learners, ECT, the government and the industry partners like REA. Data collection techniques involved mainly a triangulation where data collected qualitatively was verified by means of quantitative data.

3 CHAPTER 3: RESULTS PRESENTATION AND DISCUSSIONS

3.1. Introduction

In the preceding chapters, the problem and the goals of the study were presented. Research design and data collection techniques intended to investigate how to meet these goals were identified. An analysis of how data and its interpretations were carried out, were discussed. In chapter two, reference was made to each interview as a cycle. In this chapter, the results relating to each cycle are presented and discussed. The results were analysed and interpreted in terms of literature discussed under each research objectives.

In this chapter, the objective was to confirm or reject the assumption that changing from traditional teaching and learning approaches would lead to the production of learners in the DEE.

3.2. The First Action Research Objectives: Entrepreneurship Education

3.2.1. Introduction

In this cycle, aspects of entrepreneurship education research were examined by assessing the perceptions of entrepreneurship education among the focus group, the comparison group and the entrepreneurship-training candidates. The objective was to offer the following critical analysis of current perceptions towards entrepreneurship among the DEE learners.

3.2.2. The Results

The objective of this cycle was to establish the extent to which learners from DEE perceived entrepreneurship education as part of their curriculum. For this reason the focus group was asked: “What would you like to do after completing your studies?” On observing that none of them referred to entrepreneurship as a possible career choice, the following question was then asked: “Who of you would like to use his/her qualifications to start a business someday?” Some of the learner responded by expressing their strong feeling about first finding employment, before

starting their own businesses, while others felt they would prefer to be permanent employees until they reach retirement. The group commented that they only knew of professionals like medical doctors, lawyers and pharmacists who established businesses after qualifying.

Upon completion of the interviews, the focus group also completed a questionnaire, presented in Table 2-1. The results of the questionnaire are presented in Figures 3-1, 3-2 and 3-3. The results in Figure 3-1 showed that 31% and 30% of the focus group had a very strong and strong perception respectively, about entrepreneurship education as part of their curriculum.

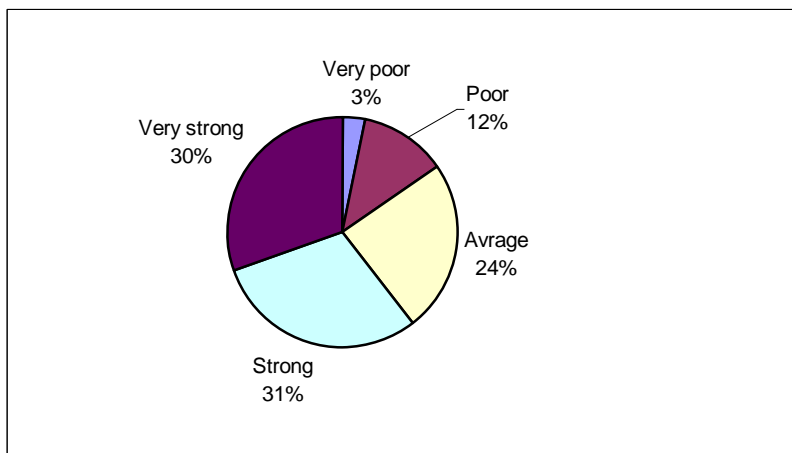


Figure 3-1: Perception Of Focus Group On Entrepreneurship Education

On the other hand, 38% and 8% of the comparison group had very strong and strong perceptions respectively about entrepreneurship education (Figure 3-2). This was interpreted to mean that the majority (54%) of the learners did not support entrepreneurship education as part of their curriculum.

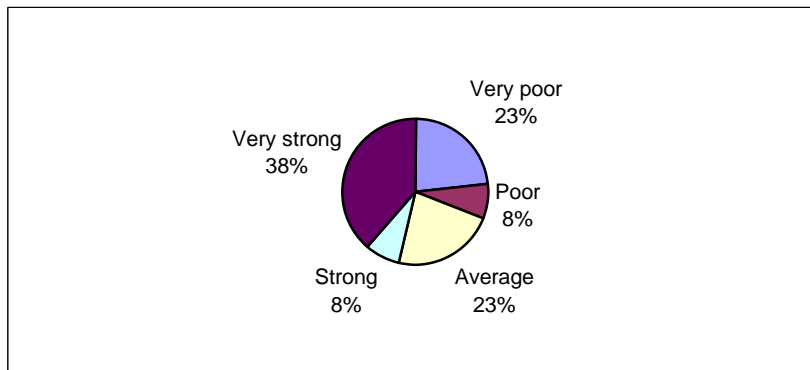


Figure 3-2: Perception Of Comparison Group On Entrepreneurship Education

Finally, it was observed that 42% and 23% of the entrepreneurship-training candidates had strong and very strong perceptions respectively about entrepreneurship education.

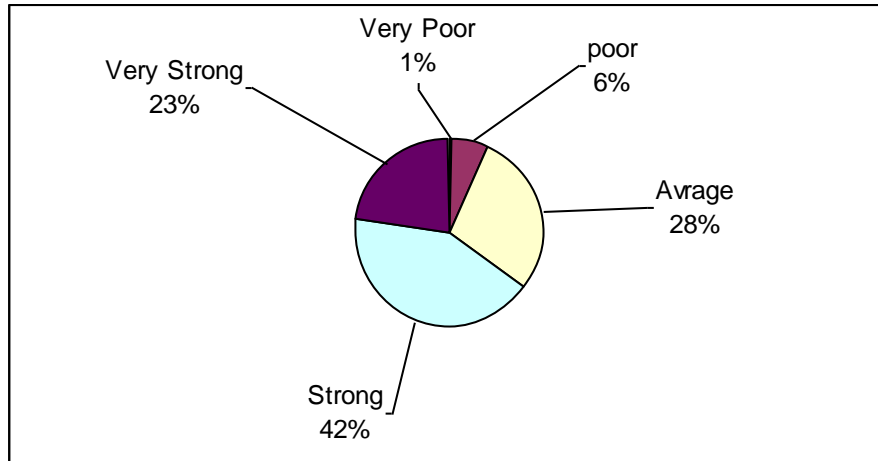


Figure 3-3: Perceptions of Entrepreneurship Training Candidates

This observation was interpreted to mean the majority of learners from this group have strong perceptions about entrepreneurship education as part of their curriculum.

Table 3-1: Overall Entrepreneurship Perception From Participants

Perception Extent	Focus Group	Comparison Group	Experiential Training Candidates	Average Perception
Very poor	30%	23%	10%	21%
Poor	12%	8%	6%	9%
Average	24%	23%	28%	25%
Strong	31%	8%	42%	27%
Very strong	30%	38%	23%	30%
Average Total	25%	20%	22%	22%

The average entrepreneurship education perception among the participants is reflected in Table 3-1 above. It can be seen from Table 3-1 that, a very strong perception of 30% dominated; followed by a 27% strong perception and 25% average perception about entrepreneurship education. Of significance, was the 42% strong perception from the entrepreneurship-training candidates. This was interpreted as the reflection of motivated learners about entrepreneurship. An average perception of 57% led to the conclusion that the majority of learners that participated in the study supported the idea of including entrepreneurship education as part of the curriculum. It was therefore concluded that there is a need for entrepreneurship education to be incorporated

in the DEE curriculum.

3.2.3. Discussion

The difference between the three groups' strong to very strong perceptions could be due to motivation that may have been gained from discussions on entrepreneurship education prior to completion of the questionnaire by the focus group and entrepreneurial training candidates. The groups, however, argued that motivation on entrepreneurship education should be entrenched, as it is part of the institution's culture that should manifest itself from its members. This was, according to the focus group, none existent. This became obvious when reference was made to ECT's mission statement towards the production of graduates with entrepreneurial spirit. The group responded by asserting that none of them ever considered the mission statement or paid serious attention to it.

The group however argued that there was generally a lack of motivation about entrepreneurship education among the learners, despite ECT's mission statement towards production of graduates with an entrepreneurial spirit. The argument submitted was that the mission statement was an espoused theory, which was perceived to be in conflict with its theory in use (action). Espoused theories are those normative theories to which individuals and organisations subscribe (Chell, 2001:58). The mission statement is also a formally and publicly acknowledged document. When this knowledge and implicit prescription to particular courses of action (entrepreneurial spirit in this case) is not necessarily met, it manifests in the behaviour and actions of managers and other employees. The knowledge that governs their actual day-to-day behaviour is their theory in-use.

Wheelen and Hunger (1998:89) link the mission statement to culture "that reflects values and expectations shared by a corporation's members and is transmitted from one employee to another". This seems to be in agreement with Chell (2001:13), who submits that "culture is an expression of deeply held beliefs and values, patterns of thinking, feeling and being able to permeate social and organisational life experience". It could be deduced from these explanations that the presence of culture should manifest itself among all the members of ECT and that understanding this culture must be important to management, leadership and employees.

The fact that culture is said to be just another variable like satisfaction or motivation that can be readily changed and manipulated (Chell 2001:13) means that entrepreneurship culture as part of ECT's can be promoted and encouraged. When this happens, ECT's espoused theory (mission statement) will be in congruency with its theory in-use and that this will draw on the employees' experience and knowledge and the shared consensus of values. This will give the institution life 'objective reality' to learners. However, when congruency does not occur between the theories, it should provide an organisational learning, which should be subjected to tests and possibly lead to the restructuring of ECT's theory of action.

The difference in perception about entrepreneurship education between the three groups supports submissions by Driver, Wood, Segal and Herrington (2001:4) about the legacy of apartheid education and other policies. According to Driver *et al* above, the apartheid system is apparent in the damage that has been done to self-esteem, motivation and creativity where many schools continue to inculcate a mindset, which undermines entrepreneurship.

There is however general understanding that research in entrepreneurship education has thus far tended to be on teacher, content, and format evaluation; the level of knowledge obtained by learners; learners enrolment, demand for future courses and comparison of approaches of one semester to another (Sexton & Kasarda, 1992:19). Another perception can be found from Brockhams (1992:1) who regards entrepreneurs as those who have started their own business, others who have bought an existing business, still others will have bought a franchise such as McDonald's and those who have inherited their business from their parents. It is argued that entrepreneurship education is made up of all kinds of experiences that give learners a vision of how to access opportunities of many different types. Research has, for instance, shown that two thirds of American entrepreneurs come from homes where someone has owned a business. This is where they get their experience (Ashmore, 2002). But where do the rest of learners learn that it is possible to create a business of their own? Sometimes the courses assume one is developing skills to be some type of manager or advance up the career ladder in a large business. Rarely have business courses assumed the learners will be the creator and owner.

It is submitted that, although business management courses are good background for those who do see themselves as future business owners, all types of educational courses can contribute to the experience of the student who might eventually become an entrepreneur. Ashmore (2002) also argues that education at all levels can include experiences that help learners see opportunities and possibilities. It can be part of any subject, be it science, business, or art related courses. It can become a part of the educational culture in the same way it is part of the culture of entrepreneurial families in other countries.

Driver, *et al* (2001:7) also submit that entrepreneurs are not necessarily born with special characteristics but that these can be acquired through life experience, and even through the entrepreneurial process itself. This submission is supported by Takyi-Asiedu & Asomaning (2001:17) and Rabbor (1990). Takyi-Asiedu & Asomaning argue that entrepreneurs and entrepreneurial potential can be developed through education; while Rabbor (1990) submits that much of the discussion in entrepreneurship education has focused on the motivation, interest and inspiration of young people, as these are motivational attributes that they have never possessed. Rabbor above also argues that in many instances people are indeed born with motivation and a willingness to take risks, but encounter barriers that erode this spirit of adventure. Rather than providing something new for young people, entrepreneurship education needs to remove some of the barriers that have eroded self-confidence and self-esteem. Along with this, the spirit of adventure and willingness to take the initiative and risk, the spirit of entrepreneurship should be promoted. These considerations should be made when one plans and develops programs for learners in the area of entrepreneurship. No one can, of course, state unequivocally that these educated entrepreneurs will eventually become entrepreneurs because they have studied entrepreneurship. Nevertheless, there are strong indications that an entrepreneurial education will produce more and better entrepreneurs than were produced in the past. Tomorrow's educated entrepreneurs will know better when, how, and where to start their new ventures.

It is therefore submitted that the underlying assumption of entrepreneurship education should not only be to educate learners who wish to start new business either independently, or more recently, in a corporate framework. This is considerably broader than the earlier focus on small business, as there is now a pressing need to develop entrepreneurial education based on the student, the

needs of the student, the format and different outcomes over points in time. It is important that entrepreneurship courses focus on learners finding opportunities and ideas that might be new and different or at least that serve needs that have not been met. Ashmore (2002:1) contends that ideas can be applied to any area of the student's special interests or the technology being studied. It doesn't require a business management course to explore the entrepreneurial opportunities that can be found. For example, in a language course one might learn about business terminology and practice making a sale in another country. That could lead to a discussion of what it takes to sell South African products in a specific country. Next learners could practice writing business letters to targeted types of individuals or companies in that country.

The above is what according to research, transformation to entrepreneurship in countries like the USA, led to regarding the 1980s as the decade in which entrepreneurship emerged as an important element in the dynamics of modern economics. In USA, considerable academic efforts have been focused upon entrepreneurship education, helping the field to develop and gain momentum; this was also true of Europe. Comparing programs in the USA, one finds different trends generally. The principal strength of prominent programs in Europe is their practical approach while entrepreneurship education in the USA on the other tends to concentrate on readings, case studies, and lectures by guest speakers as well as by the instructor. In Denmark, for example, the curriculum of entrepreneurship education includes practical aspects such as how to structure a business letter, how to order inventory, and how to negotiate a transition (Dana, 1990:14-22).

The above scenarios showed that entrepreneurship is being taught in college courses and, in some cases, academic majors in entrepreneurship have been initiated at university level. This was achieved by, for example, setting up establishments such as the European Consortium of Innovative Universities (ECIU). Consortiums like these are committed to develop and implement new forms of teaching, training and research; to stimulate an innovative culture and experiment with new forms of management and administration and to sustain and nurture internationally minded staff. All ECIU universities are involved in the process of incubating companies and have academic incubators at Science Park.

Lessons can also be learnt from tertiary institutions such as the University of Ghana, presented in chapter one. This university realised a need to promote entrepreneurship as part of their education culture. Not only tertiary institutions are involved in entrepreneurship education in Ghana, the Junior Achievement Programme for instance, is directed at exposing secondary schools to the operations of business ventures in the real world of business (Takyi-Asiedu and Asomaning, 2001:21). Other initiatives include the African Leadership Forum where final year learners from the University and Polytechnics in West Africa are being exposed to junior business seminars. The curricula for the second cycle schools and tertiary institutions (Polytechnics and Universities) are so designed that they conform to subject grouping. This was designed because of the realisation that engineering learners, for instance, had little or no knowledge at all of business management.

It could be argued and supported by Driver, *et al* (2001:4), that this is however not the case in South Africa, as the general basic education is poor for a large proportion of the population and entrepreneurship is not broadly understood and celebrated, or even supported, as a career choice. There is a social stigma attached to business failure and negative mindsets on entrepreneurship. This became evident from some of South African tertiary institutions which offer entrepreneurship as part of their curriculum. For example, in the former ML Sultan, entrepreneurship in the faculties of Arts, Engineering and Sciences, is regarded by learners from these departments as a subject used to pass, therefore as an easy credit, but do not see themselves starting businesses someday (Mbadi, 2001:129). This was evidence of the lack of self-esteem, motivation and creativity among the learners referred to in this section.

3.2.4. Conclusion

It is concluded that ECT cannot afford to disregard entrepreneurship education as this may lead to producing research products that are never commercialised but rather remain on laboratory shelves. As has happened in other countries and tertiary institutions in South Africa, an entrepreneurial spirit at ECT can be promoted in order to change the mindset of the learners from that of jobseekers to job creators. This is necessary if they are to make a significant contribution towards the economic development of this country. It is however important that the following

learners' preferred learning styles and teaching approaches be considered when entrepreneurship education is being contemplated.

3.3. The Second Research Objectives: Learning Styles, Learning And Teaching Approaches

3.3.1. Introduction

Realising that the average learners from the interviewed groups were interested in entrepreneurship education, it became important to establish which learning styles and learning and teaching approaches the learners preferred. To achieve this objective, interviews and questionnaires (Table 2-2 of chapter two) were conducted. The results from the interviews and questionnaires are presented below.

3.3.2. Learning Styles

3.3.2.1. Introduction

South Africa can no longer afford to have pupils listening passively to teachers conveying information. This was evident from statistics showing that learners retain 10% of what they hear, 20% of what they see, 40% of what is discussed with them, and 90% of what they actively practice (Gouws, 1997:147). For this reason, the Chinese ancient proverb of "Tell me, I forget, show me I will remember, and involve me I will understand" was used as stated in chapter two. The enquiry arose as a result of the need to know why learners avoided responding to questions during class sessions. It was hoped that learners would come to understand that no matter how much a teacher can tell them, their involvement is crucial. For example, they can be told what being an entrepreneur means, what entrepreneurs can do and what they need to study in order to do it, practicing entrepreneurs can give presentations in the classroom and tell learners why and how they started their businesses (Brenneke, 1990) but the decision to become entrepreneurs rests with them.

A triangulation method of inquiry where learners' learning styles were investigated in terms of section 2.4.1.2 (a) was used. It was important to understand the learners' preferred learning styles because:

- i. They help to understand the learners' areas of weakness, thus giving an opportunity to work on becoming more proficient in teaching methods. It also helps realise learners' strengths and weaknesses and that additional attention should be paid to tasks which fall outside their natural experiences
- ii. For learners, they help them understand their learning styles, and thus facilitates transitions to higher levels of personal and cognitive functioning (Knox, 1986:25).

3.3.2.2. Description of Learning Styles

There have been several different categorisations of learning styles. Wolf and Kolb offer one of them, while others authors prefer a step-by-step approach and a narrow focus. Holists prefer to obtain a bigger picture and work with illustrations. However, for the purposes of the study, the learning style proposed by Honey (1991: 47--476) together with that of Wolf and Kolb was used. From the different description on learning styles there is, however, a general consensus that once learners are actively engaged in their own learning process, they begin to feel empowered and their personal achievement and self-direction levels are elevated. This is achieved by getting the learners to become actively involved in the learning process and to understand their learning style preferences. This can positively or negatively influence their performance (Schroeder, 1996). Perhaps the most important thing is to be aware that people do not all see the world in the same way. They may have very different preferences to the educator's regarding how, when, where and how often to learn. It has been shown that adjusting teaching materials to meet the needs of a variety of learning styles benefits all learners (Schroeder, 1996). One of the commonly used learning styles are that of Kolb who showed that learning styles could be seen on a continuum running from:

- i. Concrete experience (activist style): being involved in new experience
- ii. Reflective observation (reflective style): watching others or developing observations about experience
- iii. Abstract conceptualisation (theorist style): creating theories to explain observations

- iv. Active experimentation (pragmatist style): using theories to solve problems, make decisions.

It was however important that Honey's (TABEISA, 2002:18) detailed explanation of Kolb's and Fry's learning styles together with their description of learning styles be provided as follows:

- i. Activists**

Activists involve themselves fully and without bias in new experiences. They enjoy the here and now and are happy to be dominated by immediate experiences. They are open-minded, not sceptical and this tends to make them enthusiastic about anything new. Their philosophy is: "I'll try anything once". They tend to act first and consider the consequences afterwards. Their days are filled with activity. They tackle problems by brainstorming. As soon as the excitement from one activity has died down they are busy looking for the next. They tend to thrive on the challenge of new experiences but are bored with implementation and longer-term considerations. They are gregarious people who constantly involve themselves with others but in doing so; they seek to centre all activities on themselves.

- ii. Reflectors**

Reflectors like to stand back to ponder experiences and observe them from many different perspectives. They collect data first hand from others, and prefer to think about it thoroughly before coming to any conclusion. The thorough collection analysis of data about experiences and events is what counts so they tend to postpone reaching definitive conclusions for as long as possible. Their philosophy is to be cautious. They are thoughtful people who like to consider all possible angles and implications before making a move. They prefer to take a back seat in meetings and discussions. They enjoy observing other people in action. They listen to others and get the drift of the discussion before making their own points. They tend to adopt a low profile and have a slightly distant, tolerant unruffled air about them. When they act, it is part of a wide picture which includes the past as well as the present and others' observations as well as their own.

iii. Theorists

Theorists adapt and integrate observations into complex but logically theories. They think problems through in a vertical, step-by-step, way. They assimilate disparate facts into coherent theories. They tend to be perfectionists who won't rest easily until things are tidy and fit into a rational scheme. They like to analyse and synthesise. They are keen on basic assumptions, principals, theories, models and systems thinking. Their philosophy prizes rationality and logic. "If it's logical, it's good". Questions they frequently ask are: "Does it make sense?" "How does this fit with that?" "What are the basic assumptions?" They tend to be detached, analytical and dedicated to rational objectivity rather than anything subjective or ambiguous. Their approach to problems is consistently logical. This is their "mental set" and they rigidly reject anything that doesn't fit with it. They prefer to maximize certainty and feel uncomfortable with subjective judgments, lateral thinking and anything flippant.

iv. Pragmatists

Pragmatists are keen on trying out new ideas, theories and techniques to see if they work in practice. They positively search out new ideas and take the first opportunity to experiment with applications. They like to get on with things and act quickly and confidently on ideas that attract them. They are essentially practical, down to earth people who like making practical decisions and solving problems. They respond to problems and opportunities 'as a challenge'. Their philosophy is: "There is always a better way" and "if it works, it's good".

The above descriptions were used to gain an understanding of learners' learning styles as depicted in the following results.

3.3.2.3. The Results

The results of the interview conducted using the Chinese Proverb (Annexure 3-1) showed 20% preference to be told, 40% preference to be shown and 40% preference to be involved. The results were compared with the learner's learning styles provided as follows:

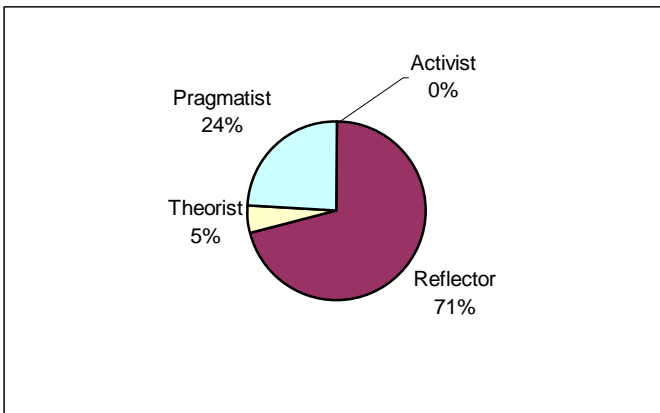


Figure 3-4: Focus Group's Learning Styles

The results (Figure 3-4) showed 71% preference for reflector style, 24% preference for pragmatist style and 5% preference for theorist's style. The results were interpreted to mean that most learners from the group possessed reflector and pragmatist styles.

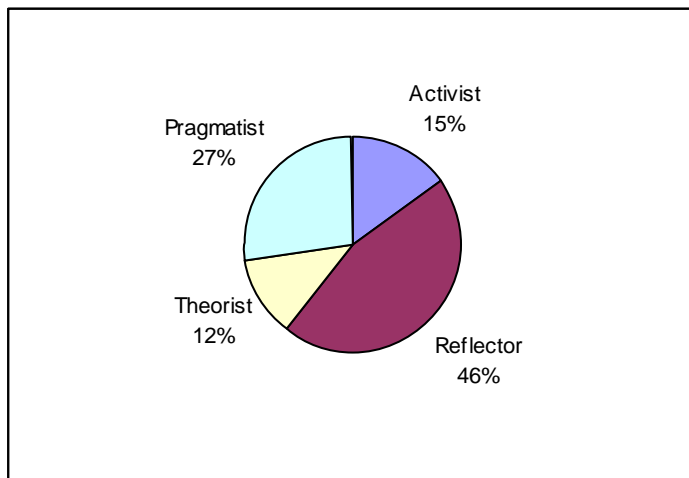


Figure 3-5: Comparison Groups Learning Styles

On the other hand the results (Figure 3-5) from the comparison group showed that there was a 46% presence of reflectors followed by 27% pragmatists. It was also observed that there was a 15% presence of activists in this group. The results were interpreted as previously, namely that the majority of learners possess reflector and pragmatists styles.

Lastly, the results in Figure 3-6 in respect of the entrepreneurship-training candidates' learning

styles showed that there was once again a significant presence of 55% and 42% of reflectors and pragmatists respectively.

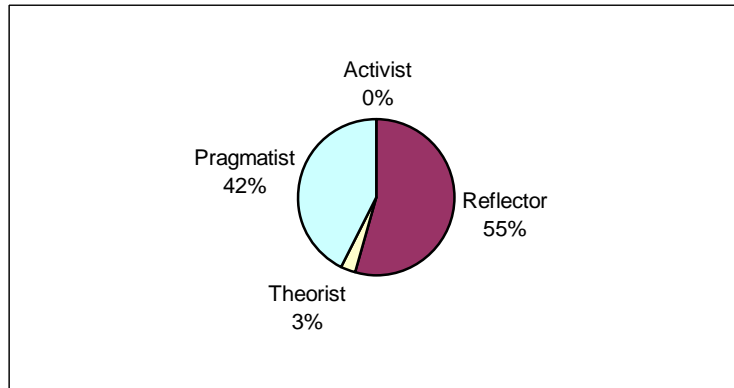


Figure 3-6: Entrepreneurship Candidate's Learning Styles

Table 3-2: Overall Learning Styles

Learning Style	Focus group	Comp Group	Entrepreneurship Candidates	Average
Activist	0%	15%	0%	5%
Reflector	71%	46%	55%	57%
Theorist	5%	12%	3%	7%
Pragmatist	24%	27%	42%	31%

An overall significance and dominance (Table 3-2) of reflectors (57%) followed by pragmatists (31%) was observed among the participating groups. It was concluded that the majority of learners involved in the study possessed reflector and pragmatist styles. Reflection on the results of the interview “Chinese proverb” led to the deduction that most learners that participated in the study generally prefer to be told and shown (i.e. a didactic approach) than to be involved and take an active role in their learning. It was then concluded that there was generally a constant trend in respect of reflectors and pragmatists among all learners that participated in the study.

3.3.2.4 Discussion of learning styles

The fact that learners voted 20% to be told and 40% to be shown, confirmed their inclination to depend on the lecturer. This observation could be confirmed from the results and description of the learning style's inventory, which showed that in all enquiries conducted in this study, the majority of learners possessed an overall of 57% reflector's and the 31% pragmatist's styles. This observation was in line with Mc Gill & Beaty (1995: 376) who contend that 70% of learners have only one or two of the four learning styles and that only 2% percent of learners have all four styles. The implication was that it is incumbent upon the teacher to provide a learning context where all four styles could be encouraged within the whole learning cycle to avoid discrimination against some learners. This approach is also said to minimise dropout rates (Gibbs, 1994), 376).

On the basis of the results, an analysis of reflectors was done in terms of how they are described earlier in this chapter. This showed that the reflectors learn best from activities where they:

- a) Are encouraged to watch /think/chew over activities
- b) Are allowed to think before acting, to assimilate before commenting
- c) Have the opportunity to review what has happened, what they have learned
- d) Can reach a decision in their own time without pressure and tight deadlines.

Pragmatists on the other hand learn best when:

- a) There is an obvious link between the subject matter and a problem or opportunity in their job of work.
- b) They are shown techniques for doing things with obvious practical advantages currently applicable to their own job.
- c) They have a chance to try out and practice techniques with coaching/feedback from a credible expert.
- d) They can concentrate on practical issues.

The results further correlate with observations and concerns raised by the researcher, namely that they like to sit back and avoid responding to questions. They also like to be shown and need time to assimilate what was taught. In an attempt to understand the implication of the various styles, a more detailed study was made of authors who have tried to catalogue the ranges of learning

styles. Kolb is perhaps one of the best known and his thinking is outlined below. Firstly, Kolb showed (Figure 3-7) that learning styles could be seen on a continuum running from:

- a) Concrete experience: being involved in a new experience
- b) Reflective observation: watching others or developing observations about own experience
- c) Abstract conceptualization: creating theories to explain observations
- d) Active experimentation: using theories to solve problems, make decisions

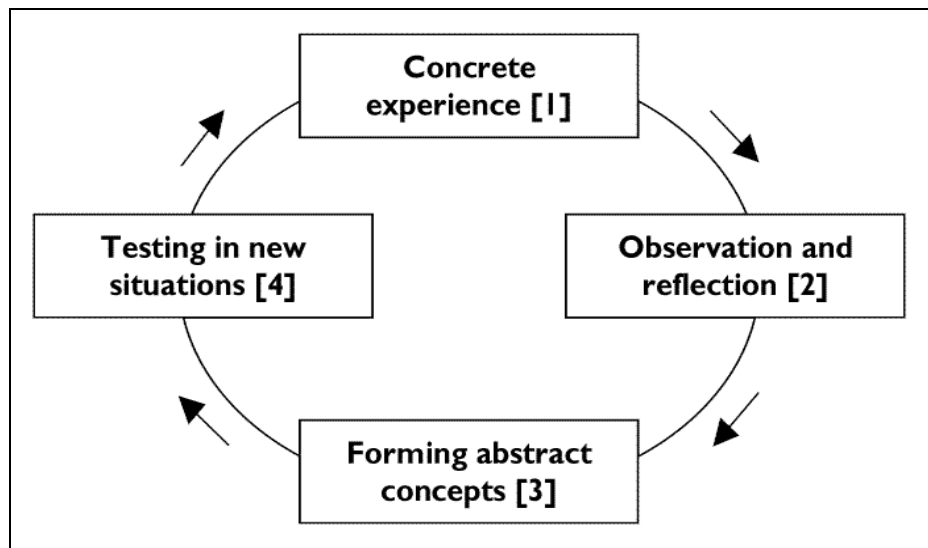


Figure 3-7: The process Of Learning From Experience

(Honey, 1991)

Honey (1991:471) on the other hand, submits that the learning styles have the following ties with the above four stages (Figure 3-6) of learning from experience:

- a) A preference for the activist's style equips one for stage 1.
- b) A preference for the reflector style equips one for stage 2.
- c) A preference for the theorist's style equips one for stage 3
- d) A preference for the pragmatist's style equips one for stage 4.

In the hope of promoting hidden learning styles, learners were assigned a project where they were required to generate and screen ideas; conduct preliminary and detailed designs as well as testing and then present the final project design. In this study (described in section 3.3.3. below), and as indicated earlier, the learners were expected to investigate a constant power failure at the

student's main campus residence as a case study. Figure 3-8 relates to Kolb's Learning Styles the project aimed to promote as follows:

- a) Stage 1: Concrete experience was promoted by allowing the learners to engage in discovering why the power failure took place and evaluate an alternative cost effective solution to the problem. This provided a framework where the learners asked questions and the researcher was able to mingle with them, answering the questions and making suggestions where necessary.
- b) Stage 2: Observation and reflection would be achieved when learners could demonstrate how to perform laboratory tests on power consuming appliances to show their contribution to the system.
- c) Stage 3: Formation of abstract concepts would occur through simulation using computer-aided designs. In this way, it was possible for the learners to discover the relevance of soliciting alternative designs.
- d) Stage 4: Testing the new knowledge through implementing revised designs in respect of the student's village. Learners were first expected to use test instruments, particularly during peak hours (i.e. morning and afternoon) and cold weather conditions where most appliances were being used.

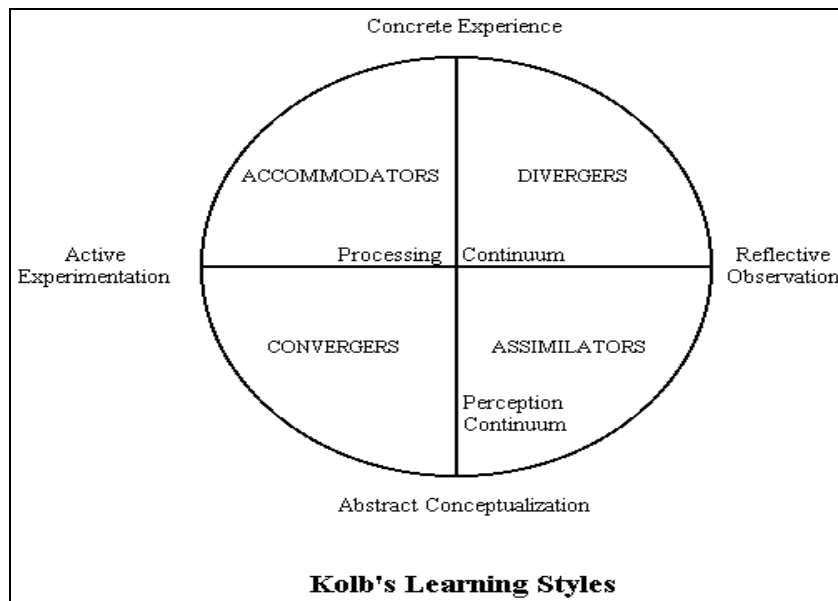


Figure 3-8: Kolb's Learning Styles
(Litzinger and Osif 1992)

In order to understand Figure 3-7 and the submission by Honey and Fry, Ketteridge and Marshall, learners are firstly involved fully and freely in new experience using a divergent learning style (activist's style). Secondly they have time and space to reflect on their experience from different perspectives, using the assimilation (reflector) learning style. It is this element in the cycle that will be strongly influenced by feedback from others. Thirdly, learners use their convergent (theorist) learning style to be able to form and re-form or process their ideas, take ownership of them and integrate their new ideas into sound logical theories. Finally, learners used the accommodator (pragmatist) learning style to make decisions, problem-solve and test implications in new situations, all of which generate material for the next cycle starting from the concrete experience.

3.3.2.5 Conclusion

Knowledge about learning styles helped understand learners' strengths and weakness so that it was possible to plan course materials that strengthened the preferred style, while also promoting the lacking learning styles in order to prepare them for the knowledge and skills needed to deal with a variety of facets required of entrepreneurs. Chell (2001:98) provides another way of thinking about learning styles. This considers the modes of being at two dimensions whose extremes are polar opposites. Hence, one dimension has at its extremes concrete reality and abstract conceptualisation and the other has reflective observation at one extreme and active experimentation at the other. These hemispheres are used in analytical, logical thinking (left hemisphere) and in synthesis or integrating many inputs simultaneously and holistically. Because all four stages of the process are necessary for effective learning to be achieved, it was therefore concluded that for successful entrepreneurs, all learning styles are critical if they are to think logically and intuitively during their day-to-day operations.

3.3.3 Learning and Teaching Approaches

3.3.3.1 Introduction

Whenever one is confronted with the term learning style, it is important to be conscious about which categorisation is being referred to in order to avoid confusing learning styles with approaches to study (Fry, Ketteridge and Marshall, 1999:32). Learning approaches are classified as deep or surface learning. A deep approach to learning is typified as an intention to understand and seek meaning, leading learners to attempt to relate concepts to existing experience, distinguishing between new ideas and existing knowledge, and critically evaluating and determining key themes and concepts. Such an approach results from the learners' intention to gain maximum meaning from their studying, which they achieve through a high level of cognitive processing, throughout the learning activity. Surface approach on the other hand, is typified as an intention to complete the task, memorise information, make no distinction between new ideas and existing knowledge, and to treat the task as externally imposed (Fry, Ketteridge and Marshall (1999:32).

It was argued that the latter approach is not suitable in entrepreneurship because, entrepreneurs must be able to engage with new experience and be able to distinguish between the old ones. This is particularly true in the world of fast changing technology which means that it is important that entrepreneurs be prepared to learn and relearn, and also be able to de-learn old habits in lieu of new ones.

On the basis of the understanding of learners' learning style preferences and their interpretations, experiential learning, which can be linked to the deep approach, was considered as an innovative learning and teaching approach. It was therefore implemented as part of the study. It was chosen as an approach because of its holistic nature of combining experience, perception, cognition and behaviour. Moreover, it is about a process of learning where ideas are formed and reformed through experience, a process which permits adaptation (Chell, 2001:98). There were two ways of making experiential learning an integral part of course design: firstly to provide opportunities for experience in the form of structured and pre-planned practical work which would develop

skills and techniques within the controlled environment of the institution. The second approach was to give learners the opportunity to learn from experience within a naturalistic work environment (Fry, *et al*, 1999:137). This implied that the key to effective learning was encouraging learners to draw from experience and to link critical incidents in the experience to ideas and theories in order to gain insight.

In order to realise the effect of experiential learning as an innovative learning and teaching approach the following discussion is presented:

3.3.3.2 Discussions

Methods, which promote experiential learning in an institution, are included in Figure 3-9 where the elements of experiential learning methods as strategies for improving the quality of student learning are realised by fostering a deep approach. This could be typified with a deep approach where a learner attempts to make sense of what is to be learnt. This consists of ideas and concepts. This involves thinking, seeking integration between components and between tasks, and playing with ideas.

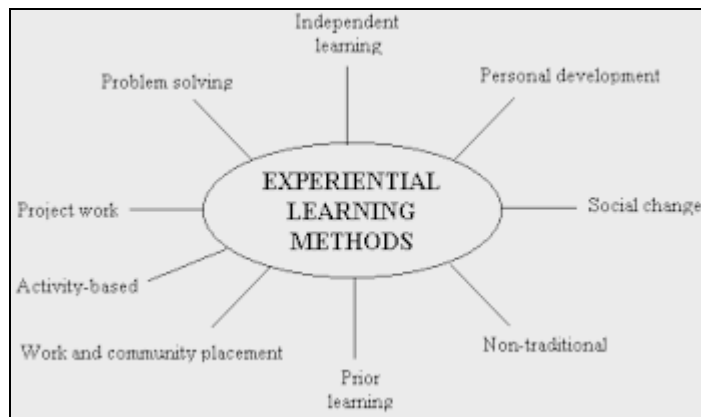


Figure 3-9: Meaning of Experiential Learning
(Henry Jane, 1989)

For these reasons, the following specific forms of experiential learning were implemented in the study. Each of these approaches used were mainly teacher-designed to allow practice of

technical or interpersonal skills and to promote understanding of the relevance of the course to the real world (Fry, *et al*, 1999:138). In this form of learning, learners were able to involve themselves fully with their new experience, reflect upon it from different perspectives, label it in a new way which integrates the experience into a theoretical frame and then use it to make decisions and solve problems (Chell, 2001:98).

In appreciating experiential learning, it was necessary to underpin many of the different types of teaching activities presented hereunder. These include work-based learning, teaching laboratory and practical work, action learning, role-play, small group teaching and many others. In implementing the suggested approaches, cognisance was taken of the fact that:

- a) Activists respond most positively to learning situations offering challenge, where they are exposed to new experiences and problems, excitement and freedom in their learning.
- b) Reflectors respond most positively to structured learning activities where they are provided with time to observe and reflect, and are allowed to work in a detailed manner.
- c) Theorists respond well to a logical rational structure and clear aims, where they are given time for methodical exploration and opportunities to question and stretch their intellect.
- d) Pragmatists respond most positively to practically based, immediately relevant learning activities, which allow scope for practice and using theory.

a) Project Work

The assigned project was used to expose the focus group to a practical environment, where they had to determine and analyse the cause of a power interruption at student's village. The village is comprised of 40 blocks of flats, each accommodating 10 single rooms. The problem arose from the learners using thermal power appliances, particularly in winter when heaters, kettles and other intensive power utilising appliances are being used. The purpose was to give learners the opportunity to study problem solving in depth as projects can give learners experience of research, analysis and recoding as well as valuable practice in writing reports (D'Andrea, 1999:139).

b) Action Learning

Once the focus group was assigned a project, they established action-learning sets in order to engage in action learning. Mc Gill and Beaty (1995: Chapter 2) makes a distinction between action learning as a process through learning, and action research method. "Both action learning and action research are based on the same learning cycle. They both share the focus on learning experience and have action and a reflective phase. It is a continuous process of learning and reflection, supported by participants, with the intention of getting things done." Through action learning, participants learn with and from each other by working on real problems such as the student's village power problem. Time is allocated for reflection so that action-learning links the natural processes of learning with a "questioning" based structure being utilised to ensure that it happens.

Action learning is a particular structural approach directed to learning in a social setting wherein questions from others form an important part of the activity. It was developed by Revans (1982) in Mc Gill and Beaty, who describes its attributes as "learning with and from each other", "foreseeing future problems" and "using yesterday's wisdom well". It involves a group of people called a set, who work together for a concentrated period of time. The action side of the equation is called the project (Mc Gill and Beaty, 1995: Chapter 2). It was the individual learners who brought to the set the aim to learn from experience and to move to more effective action. The set enabled the process to take place through group effort focused on the issue of each individual.

In this study, set members from the focus group (Annexure 3-3) joined together expressly to work on a project to solve a problem relating to power interruption at the student's village. Timelines were used to report on progress, where each group had to report on achievements made and reflections conducted jointly as a class. In this way, action-learning introduced structure to social learning. The structure included interaction with others, so that the richness of data available for reflection was enhanced. Further, action learning sought action as an outcome of the learning. When done rigorously, action learning provides a way of ensuring reflection as a part of social learning, i.e. learning through interaction with others. A dialogue was created to ensure higher quality reflection.

The possibility of the social (i.e. educational) aspects of action learning providing for effective reflection and the potential for the development of new methods about entrepreneurship education was an important consideration in developing this study. Furthermore, the researcher perceived it as having the potential for individuals to form sets based on their needs in a specific situational analysis. This has since been referred to as participant led set formation and was reported to offer the most valuable learning opportunities.

The preceding description of action learning as learning and teaching method identifies action learning as a form of experiential learning, but distinguishes it from the classic Kolbian model. The emphasis in action learning was on developing social interactions between learners involved in similar activities (i.e. focus, comparison groups and the entrepreneurship training candidates) as the structure for reflectively questioning existing thinking about entrepreneurship education. The learning outcomes were then used as the basis for personal adaptation or change. It is the social and questioning aspects of action learning together with the potential for participant initiation of sets that drew the researcher's attention to it as a focus for developing self-reliance among learners.

The implementation and effectiveness of an action learning method of experiential learning became significant as reflected in Annexure 3-3.

c) Simulation

As part of the experiential learning, learners were expected to simulate their ideas and evaluate them against stipulated standards such as those of the South African Bureau of Standards. Simulations are attempts to create a realistic experience in a controlled environment. They have been created using computer aided design (CAD) to show how altering variables affect complex machinery. They create a powerful learning opportunity but they also require a great deal of careful planning and construction (Fry *et al*, 1999:139).

In the project, simulated results were used to make recommendations for the upgrade of the power system at the student's village. In implementing simulation, the researcher had to make sure that the learning which comes from undertaking the simulation is linked back to the

objectives of the course, and that the results were tested by means of an instrument to make them as real as possible. At the end, learners were able to confirm that results obtained were to an extent, similar to those measured by means of the physical instrument.

d) Field-Trips

Field trips combine work in a tertiary institution and work in a naturalistic setting. As part of the learning exercise, and because heavy current could be dangerous, access into switch yards was therefore limited to trained and company employees. In this regard, arrangements were made with the national electricity utility, to take learners on a tour of the generation power station, substation and in transmission lines. The aim was to give learners the opportunity to ask questions from the practitioners themselves, thereby affirming what was learnt in the classroom. The purpose and scheduling of the trip were discussed beforehand and learners were expected to provide written reports after the trip. The advantage of the field trip was that the visual and physical impact of the setting (power and substation in this case) brought the theory to life. Field trips also contributed to team building.

e) Work Based Learning

Learners need not only be thoroughly trained regarding the theory in the classroom, but also to be exposed to a real practical training environment to prepare themselves for the real world. To achieve this, learners had to be placed and trained for a period of six to twelve months at a workstation of an approved employer. The learners were then trained, guided and monitored by mentors during the experiential learning period. The success of this programme of education, called cooperative education, depends largely on close cooperation with commerce, industry, government and the community. In cooperative education, learners became involved and were willing to learn from their experienced colleagues.

After introducing the experiential learning and teaching as innovative approaches, the results obtained in terms of Table 2-3 of chapter two were analysed. The inquiry was conducted with the focus, comparison and entrepreneurship training candidates groups. These are the learners

who have completed their practical training called P1 and P2, are ready to enter a working environment. As part of the study, these learners were interviewed about their training and its relation to theory gained at ECT.

3.3.3.3 Results

The results reflected in Table 3-3 in respect of the focus group showed 56% strong preference for the innovative learning approach. The comparison and entrepreneurship-training candidates showed respectively 46% and 53% preference for innovative learning approach. The overall results showed 54% preference for innovative learning. The interpretation of the results was that the majority of learners that participated in the study preferred an innovative learning approach.

Table 3-3: Results of Innovative Learning

Participants	Traditional Learning Approach	Innovative Learning Approach
Focus Group	44%	56%
Comparison Group	54%	46%
Entrepreneurship Training Candidates	47%	53%
Average	46%	54%

With regard to teaching approaches, the results (Table 3-4) showed that 54% of the focus group preferred the innovative teaching approach, while 56% of the comparison group still preferred a traditional teaching approach. On the other hand, the entrepreneurship-training candidates showed a 53% preference for entrepreneurial teaching approaches.

The overall average results (Table 3-4) were interpreted as that 51% from all the groups preferred an entrepreneurial teaching approach. It was then concluded that there was a general desire to shift, (although by a small margin of 51%) from traditional to entrepreneurial approach methods by the participants.

Table 3-4: Traditional Vs Innovative Teaching Approach

Participants	Traditional Teaching Approach	Innovative Teaching Approach
Focus Group	46%	54%
Comparison Group	56%	44%
Entrepreneurship Candidates	45%	55%
Average	49%	51%

3.3.3.4 Conclusion

It was concluded that preference for traditional teaching approach from the comparison group has had a significant impact on the overall average results. These results proved that the implementation of innovative learning and teaching approaches had an effect on both the focus group as well as the entrepreneurship-training candidates. It was finally deduced that changing to innovative teaching and learning approaches yielded the desired effect.

3.4. The Third Action Research Objective: Strategies for Entrepreneurship Training

3.4.1. Introduction

The third objective of the study was to investigate strategies that would expose learners to entrepreneurship training with the aim of producing prospective entrepreneurs. As indicated, these are ECT electrical engineering learners who have completed their studies towards their diplomas and are due to seek employment. They included the focus, the comparison groups and entrepreneurship-training candidates. In order to meet this objective, a new product or service as an entry wedge was considered.

This concept of new products or services as one of the entry wedges is espoused by Bygrave

(1994:56) and Chell (2001:56). According these authors, entry to business can be established through one of the following strategies for breaking into the competitive business arena:

- a) Developing a new business product or service
- b) Developing a similar, but better, product, i.e. the "better mousetrap"
- c) Buying a franchise
- d) Exploring an existing product or service
- e) Sponsoring a startup
- f) Acquiring a going concern
- g) Business incubation

New products or services development are associated with creativity and innovation (Buijs: 2002:2). It is new for the people who have to implement it, irrespective of whether others somewhere else on the globe have already gone through the pain of implementation. Koorts (2002:1) contends that innovation cannot be left entirely to the private sector. Firstly, despite the sterling quality of their research, their laboratories are too expensive and too centralised for today's fast-paced and competitive markets and secondly, the centre of economic gravity is shifting toward small and mid-sized companies that need a constant flow of ideas and discoveries that can be translated into new products, process and technologies.

In the same spirit, renewable energy was regarded as a new product or service entry wedge at ECT. In introducing the product or service development at ECT, environmental scanning, strategic formulation and implementation, and evaluation and control were considered. Using this strategy, it was deemed fit to:

- a) Use the renewable energy as a new product and service to ECT to electrify no less than 50,000 households in the Amatola DC 12 and OR Tambo EC 157.
- b) Invite learners to apply for entrepreneurship experiential learning.
- c) Teach selected learners (as a case study) on the theoretical and practical aspects of entrepreneurship through the project collaboration, where after they will prepare and submit business plans and proposals to design, install and maintain renewable energy system in the electrification areas mentioned in (a).
- d) Award contracts to successful business plans and proposals as part of the electrification

programme presented in Table 3-5.

3.4.2. The Results

The objective was achieved through a collaboration agreement with an industry partner where the learners could be trained. This was achieved through the new products or service development as a strategy for ECT with the specific aims of responding to the mission statement in terms of:

- a) Providing appropriate, technological, career-oriented education in cooperation with commerce, industry, the government and the community;
- b) Providing quality teaching, research, development and community services sensitive to needs and trends;
- c) Providing graduates with an entrepreneurial spirit, a good work ethic and responsible leadership.

In this regard, contacts with government, industry, communities and other institutions at national and international levels were met. At government level, a new product in the form of renewable energy was identified wherein the needs of the government to deliver services to rural communities were realised. During the process, the government introduced the researcher to a service provider who had been awarded a concession area contract to provide renewable energy in a municipality district council called Amatola DC 12, part of which is presented in Figure 3-10 and the OR Tambo Municipality EC 157.

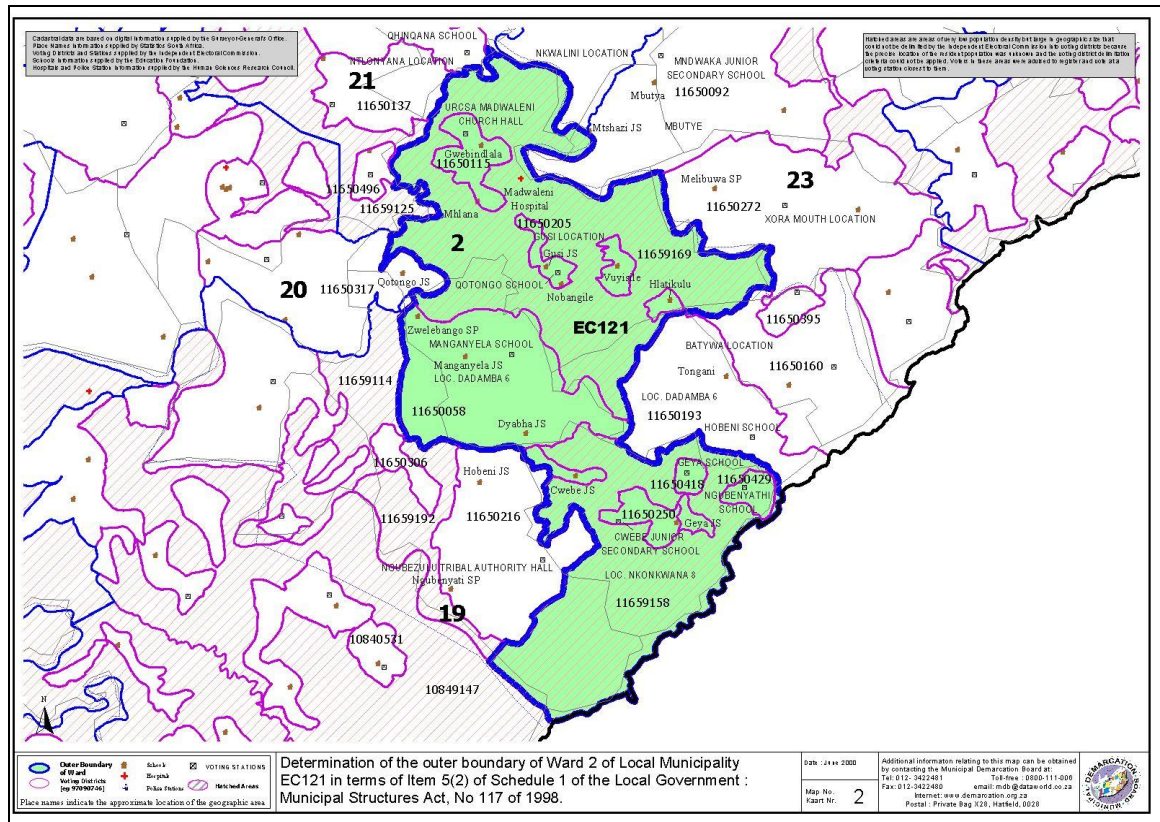


Figure 3-10: Part of Amatola Municipality District 12 In The Eastern Cape
(SA Explorer, 2002)

The new product or service to be rendered is expected to create entrepreneurship and employment opportunities as reflected in Table 3-5 and Figure 3-11. To achieve this objective, the project is broken down into the following categories:

- Infrastructure and training of personnel;
- The supply of fuel cells;
- The installation of lights and wiring into the households;
- The supply of “container shops“ where the used fuel cell anodes will be exchanged for recharged ones, and the installation of the recharged anodes into the fuel cell housing can be done, as well as the stripping of the used anodes into its two basic components to allow for recycling (AEDC, 2002).

The project is also expected to promote the employment of physically handicapped people, who can demonstrate their value to society through practical training programmes and also earn an

income. Successful learners will receive an advanced education as fuel cell technicians and later run their own service shops as owners and entrepreneurs. They can also, from time to time, perform maintenance work, such as change blown out lights, which might have exceeded their life span. The objectives were realised when immediately after the conclusion of the agreement between ECT and REA and as a consequence to the media release (Annexure 3-8), numerous calls from the learners and their relatives enquiring about the project were received. The enquirers were subsequently advised to submit applications and curriculum vitae (CVs) to the Department of Cooperative Education of ECT (Annexure 3-11), where 33 applications and CVs were received. Twenty-seven (27) learners were subsequently interviewed.

There will be one installation team made of one learner per three rural communities members and one fuel cell recharge shop per 250 houses. The aim is to train rural community women, called a “harnessing team”, to assemble harnesses, while community men, called an installation team, will be trained as installers made of two men per four houses. These men and women are set to be trained by ECT learners who will ultimately recharge and maintain fuel cell shops as submitted in Annexure 3-7.

Table 3-5: Employment And Entrepreneurship Creation For The Eastern Cape
(AEDC, 2002)

Year	A	B	C
2003	30	125	200
2004	50	275	440
2005	20	395	632
2006	20	515	824
2007	20	635	1016
2008	20	755	1208

Where:

- A = Harnessing team
 B = Installation team (2 per 400 houses)
 C = Service shops (2 per 250 houses)

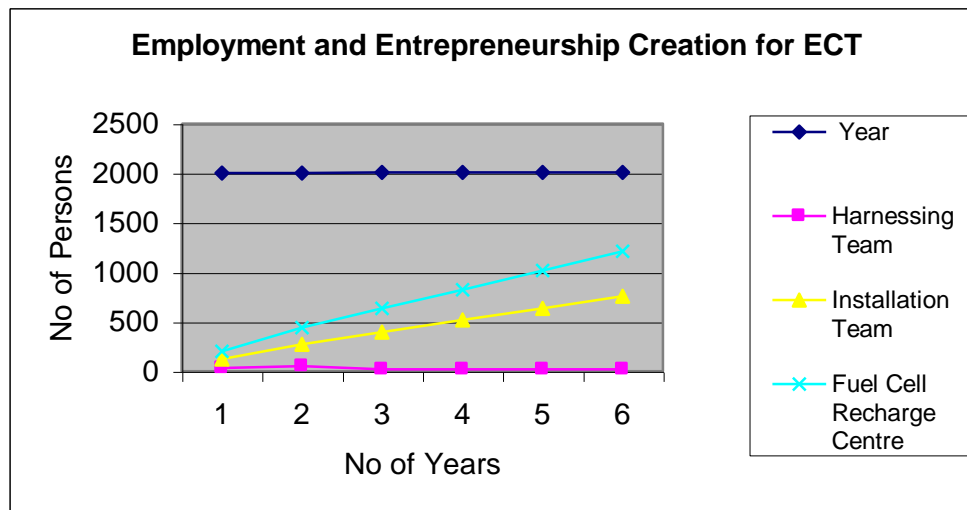


Figure 3-11: Employment and Entrepreneurship Creation for Amatola DC 12 and OR Tambo EC 157

As seen from Table 3-5 and Figure 3-11, the project will provide approximately 20 to 50 employment opportunities per ward for rural women (A), 125 to 755 jobs for rural men as installation teams (B), and 200 to 1208 entrepreneurs (C) between 2003 and 2008.

Table 3-6: Demographics In EC 121 & 157

(SA Explorer, 2002)

Status	EC 121	EC 157	TOTAL	%
No of Households	48803	80670	129473	N//A
Employed	10311	42601	52912	41%
Unemployed	23529	42884	66413	51%
Employment	188	315	503	0%
Unspecified	308	9910	10218	8%
Total	34336	95710	130046	100%

Accordingly, the 129473 households reflected on Table 3-6, will provide 324 new jobs for installation teams and 20 to 50 per ward women to 66414 unemployed rural communities in EC 121 and EC 157. A total of 518 fuel cell service shops, hence new entrepreneurs, will be created in EC 121 and EC 157.

3.4.3 Discussion

The concept of industry-partnership is not unique to ECT as could be realised from discussions in chapter one, that the European Consortium of Innovative Universities (ECIU) and the University of Dortmund have close ties to industry. These universities are generally firmly rooted in and committed to the development of the regions in which they are situated and have academic strength in engineering and social science and some within the humanities. All are relatively young, entrepreneurial and progressive. They are committed to develop and implement new forms of teaching, training and research; to stimulate an innovative culture and experiment with new forms of management and administration, to sustain and nurture internationally minded staff (Kokkerler, 2002:7). The ECIU regard learners as the main carrier of innovation between university and society, their prime focus being to educate scientists and engineers who are job creators, and not job seekers (Kokkerler, 2002:12). Using the ECIU model, it is the aim of the entrepreneurship education programme at DEE to:

- i. Elucidate the role of creativity: entrepreneurial and innovative business activities and their management, within a global environment, and to promote gender and ethnic diversity.
- ii. Communicate an up-to-date body of knowledge about the nature and scope of new business formation and its application, within an ethical business context.
- iii. Engender critical analytical skills, creative problem solving in the development and evaluation of new venture ideas, while understanding both the opportunities and constraints faced by entrepreneurs and entrepreneurs.
- iv. Empower the learners in the department with the means to engage in entrepreneurial activity and self-employment.

The above will be dealt with as part of the experiential training or cooperative education which the World Association for Cooperative Education (WACE) regards as a method of education that combines learning in the classroom (theoretical studies) with learning in the workplace (experiential learning). Cooperative education forms part of the competitive edge of Technikons. For this reason a number of Technikon programmes make provision for an experiential learning component, either through work or community placement. This form of training plays an important role in ensuring that learners acquire critical cross-field outcomes, required by the

National Qualifications Framework (NQF). One of the outcomes required by SAQA is the development of entrepreneurship opportunities.

Examples of this kind of programme can be cited from Seedat (2001:136) who reported that in view of the importance of exposing learners to the working environment, “the Department has incorporated experiential training into the IT curriculum, whereby final year learners are required to undertake the development of a non-trivial project obtained from industry”. Learners are required to work in teams of five to six to apply the information system, business and management knowledge to develop a computer-based application using an appropriate programming language and the technology platform. It was equally important and necessary to establish the collaboration with REA where learners who have completed the electrical engineering diploma programme would be exposed to entrepreneurship experiential training.

REA is a relatively a young black economic empowerment company, with one of its weaknesses being the lack of experience in the field of renewable energy. It was therefore the objective of the agreement to serve the two organisations firstly to provide skills transfer to learners and secondly, assist REA towards growth by providing, on a contract basis, the human power in the form of the learners where-after they would be allocated parts of the concession area for design, installation and maintenance purposes. In this way, the learners would be encouraged to become entrepreneurs. The latter is referred to as business incubation. Business incubators, referred to as workspaces are intended to increase job generation and business development/start-up (Chell, 2001:58).

The Science Parks and business incubators like the Technikon Free State Technikon and Greenwich (Figure 3-12) respectively provide incubation centres to a wide range of support to new innovators. New products and processes are developed by these innovators under close mentorship of academics. This approach is also used by ECIU which in 1999, held a seminar on academic incubation with a focal theme for cooperation, identified firstly as pre-incubation where the seminar discussed how entrepreneurship could be stimulated and learners (and staff) be supported to star-up their own companies and, secondly, establish how could the incubation infrastructure get access to finance for different stages of company development (Kokkeler,

2002:8)



Figure 3-12: Greenwich Business Small Incubation Centre.

(Evans, 2002)

Another example is the system of education through practical experience rather than classroom studies which applies to key qualifications where learning through thinking and recognition is the academic way in High Potential Programme of the Management Institute of the University of Mittweide, Germany (Jesenberger, 2002:7). These examples serve as a model and source of motivation from which ECT could establish a similar centre.

The concept of establishing entrepreneurship education at ECT and academic collaboration has been welcomed by institutions such as Technikon South Africa (TSA). TSA has pledged its support towards this development (Annexure 3-11). For this reason, the Technikon extended its welcome to assist in registering learners for distant studies in respect of ten learners whilst ECT will begin to apply for approval from the relevant authorities to offer the course at Bachelor Degree level. Consequently, a budget to register 10 learners at TSA has been applied for from the THRIP funds. Once funds are approved, the researcher, in collaboration with the deputy chief lecturer: Entrepreneurship at TSA, Dr Nieuwenhuizen, will ensure that the course is offered to selected learners. Permission to use TSA's study guide as a temporal measure has since been solicited and welcomed (Annexure 3-12)

3.4.3. Conclusion

The success of collaboration agreements between ECT and REA is in line with the latest developments in the Higher Education fraternity. The developments include forging partnerships to stimulate innovation in both the short and long-term partnership with government, industry and with other segments of education (Koorts, 20002:1). This partnership also meets the mission statement of ECT to provide appropriate, technological, career oriented education in cooperation with commerce, industry, the government and the community. This will also help produce graduates with an entrepreneurial spirit, good work ethics and responsible leadership.

The results of the partnership will serve as a vehicle to realise a considerable number of learners being trained to become entrepreneurs hence job providers to the number of unemployed people in the concession area. On the other hand, the support received from the government, management of ECT and REA proved that a need to cooperate and integrate theory with practical training receivable from industry was unavoidable.

3.5. Assessments and Evaluation of Learners and Teaching Performance

3.5.1. Assessments of Learners Performance

3.5.1.1. Introduction

To establish whether the objectives of the study were achieved, assessments in the form of tasks, tests and examinations set and marked for learners by the researcher were used. Assessment is measurement of the extent of learning in individuals (Sieborger and Macintosh, 2000:5). Sieborger and Macintosh submit that evaluation is used as a process by which effects and effectiveness of teaching can be determined. In the circumstances, assessment and evaluations of the extent of the innovative learning and teaching methods formed part of the study and were implemented as follows:

3.5.1.2 Assessment of Learners

Assessment involved setting the criteria for assessing the work, selecting the evidence that would be relevant to submit and making a judgment about the extent to which these criteria had been met. Assessments or performance tests were used to assess complex cognitive processes, as well as attitudes and social skills. In this way, it was possible to observe and to rate learners as they analysed and evaluated the problem relating to the assigned project. The learners were also assessed on how they solved the problem through experiment, decision-making, cooperation with others, oral presentation and report writing (Annexure 3-2). In this way it was hoped to achieve a simulation of a real-world situation, which might be experienced in a job community.

The assessment instruments used were practical exercises, assignments, the project, class tests, year marks towards the final examination and the examination itself. The assignment, project and final year examination will be reported on, as they formed part of the central theme of the innovative learning and teaching outcomes of the study.

3.5.1.3 The Results

a) Assignments and the project

Annexure 3-3 presents a feedback from the different groups called action-learning sets of the focus group. Observations made ranged from the effectiveness of the project, to lack of cooperation and absenteeism among some members of the sets. Arguments over disagreements were also reported. Nevertheless, it was concluded that the majority of learners remarked positively about the set formations as realised in the annexure.

b) Year marks and examinations

Examination year marks helped to decide whether learners could sit for examinations or not. The impact of the researcher's revised teaching strategy were also assessed against how the focus group performed during their examinations, and against other subjects in the department. Table

3-7 showed how the focus group performed in terms of semester exams entry marks (EM), their final examinations (FM) results and comparison to other subjects. The results showed the difference between the semester marks against the final examinations mark as 1 %. On the other hand, the results showed 13%, 19% and 27% between the semester examinations entry marks, power electronics marks, electrical machines and control systems respectively.

Based on Table 3-7, presented below, it was concluded that the learners from the focus group performed better than in other subjects of the same level but offered by different lecturers. It is nevertheless observed that there were instances (marked in bold) where some learners' results were better than those of the researcher.

NB: From the Table, the following abbreviations indicate the full meanings.

COSB = CONTROL SYSTEM
 EMAC= ELECTRICAL MACHINES
 EM = EXMAINATION ENTRY MARK
 EPRO = ELECTRICAL PROTECTION
 FM = FINAL MARKS
 PELE = POWER ELECTRONICS

Table 3-7: Student's Exams Entry And Final Marks

ELECTRICAL PROTECTION 2002 EXAMS MARKS						
		EPRO		PELE	EMAC	COSB
No	Student No	EM	FM			
1	2002156	85%	86%	67%	N/A	N/A
2	2000175	78%	74%	77%	N/A	54%
3	9801672	76%	73%	52%	N/A	35%
4	9901678	58%	64%	N/A	49%	31%
5	9901619	80%	73%	N/A	48%	N/A
6	2001451	68%	67%	65%	N/A	N/A
7	9901935	41%	48%	48%	N/A	N/A
8	9901695	49%	46%	39%	28%	N/A
9	2002296	76%	72%	36%	N/A	63%
10	2002336	69%	59%	68%	71%	53%
11	2002205	76%	68%	61%	56%	N/A

TOWARDS THE ESTABLISHMENT OF AN ENTREPRENEURIAL CULTURE AT EASTERN CAPE TECHNIKON: A STRATEGY WITHIN THE DEPARTMENT OF ELECTRICAL ENGINEERING
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12	9901696	70%	68%	67%	N/A	63%
13	9901786	40%	44%	38%	33%	N/A
14	9930129	55%	59%	65%	N/A	N/A
15	2002337	73%	64%	60%	58%	N/A
16	2001262	79%	68%	N/A	53%	N/A
17	9901508	73%	67%	51%	50%	N/A
18	2000336	69%	59%	68%	N/A	N/A
19	201301098	93%	92%	63%	68%	60%
20	2008302	77%	78%	48%	N/A	N/A
21	20134758	70%	76%	61%	68%	47%
22	9930044	73%	75%	47%	48%	52%
23	20130233	70%	71%	N/A	65%	50%
24	2008183	50%	59%	N/A	43%	
25	2008217	33%	45%	N/A	59%	N/A
26	2008151	50%	50%	56%	N/A	45%
Average Pass		67%	66%	57%	53%	50%
Variance		N/A	1%	13%	19%	27%

3.5.1.4 Discussion

Performance tests presented a situation where it was possible to observe achievement in written tests, examinations, group presentations and reports, habits of mind such as impolite discussions from some learners, ways of working such as groups or individuals, and behaviours of value such as absenteeism, lack of contribution and fighting among learners. These were sometimes achieved in a way that learners were unaware that assessment was taking place. The tests included observing and rating learners as they carried out a dialogue, conducted simulations, worked as action learning sets and presented reports such as in Annexure 3-3. In this way it was possible to observe and evaluate learners' abilities to carry out complex activities that could also be used and valued outside the confines of the classroom.

Performance tests were not only used to assess higher-level of cognitive skills but also non-cognitive outcomes such as self-direction, ability to work with each other, and social awareness.

These encompass the social and affective domain learning that involved the ability to communicate, teamwork, management and value development, personal development, aesthetic appreciation and so on. It also involved observing habits of learners, their attitudes, and social skills. In general, performance tests were carried out in terms of the domains developed by psychologists like Bloom, who headed a group of educational psychologists to develop a classification of levels of intellectual behaviours important in learning. These became taxonomies, including overlapping domains reflected in Figure 3-9, the cognitive affective; psychomotor, and social (DLRN, 2001).

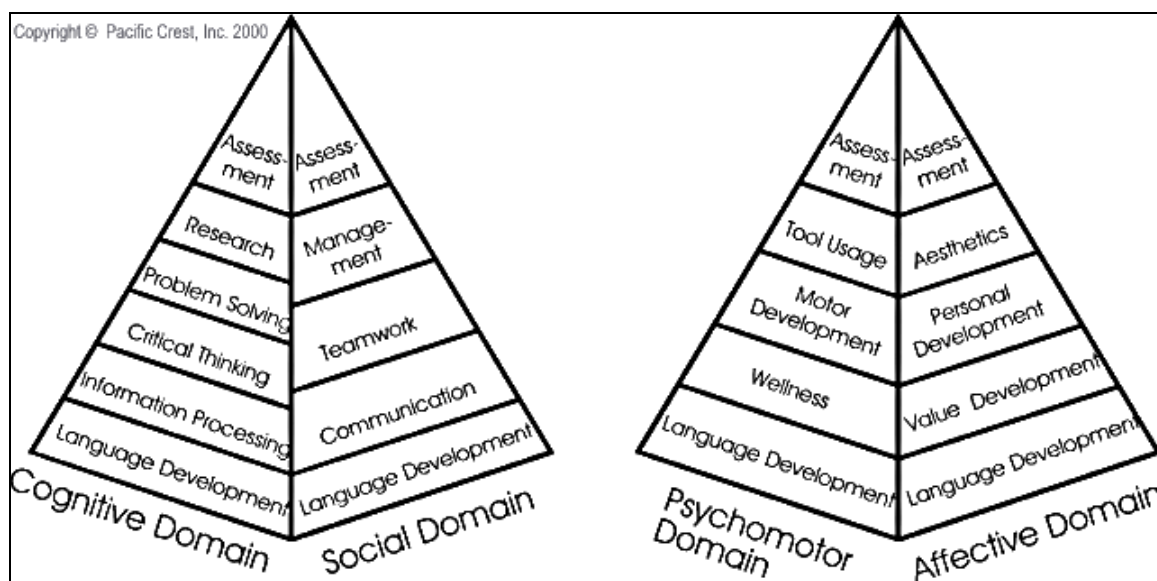


Figure 3-13: Bloom/Krathworld Taxonomy (Apple and Krumsieg, 2001)

Performance tests that would show cognitive domain were assessed on how well learners comprehended and applied theory and knowledge in order to realise a cost effective, safe and reliable supply to the residence. For this reason, learners were required to analyse, synthesise and evaluate alternative options provided from the knowledge obtained from their studies. The results would indicate how well learners received, responded to and valued the theory learnt. The psychomotor domain was demonstrated by the ability to use CAD packages, and test equipment. Learners were assessed on how they manipulated and the precision with which they articulated their knowledge of the package.

Arguments reported to have taken place among the learners during group participation, were

normal as they signaled the presence of habits and the difference between espoused theory and theory in action among the set members. The difference between the two theories resulted in tension and, as stated in the report, led to potential learning. The difference between the two theories would be as the result of learners wishing to maintain individual theories in use. This is known as single loop learning and, where change to lesson mismatch occurred, double loop learning is said to have taken place. This involved restructuring individual learner's underlying values, which they believe to be more important course of action. Learning could only be said to have occurred if these changes were accepted. Single and double loop learning come from Argyris and Schon's work based on the belief that people are designers of action. They design action in order to achieve intended consequences and monitor this in order to learn if the actions are effective (Dick, 2001). This is called Argyris and Schon's theory on congruency and learning. This theory is important in helping entrepreneurs develop their critical thinking. Angelo (1995) stresses the use of ongoing classroom assessment as a way to monitor and facilitate learners' critical thinking. Cooper (1995:8) also argues that putting learners in group learning situations is the best way to foster critical thinking. "In properly structured cooperative learning environments, learners perform more of the active, critical thinking with continuous support and feedback from other learners and the teacher."

Performance tests, sometimes referred to as assessment within traditional education and training, consisted mainly of written tests or examinations and competency tests where all the learners were assessed according to set memoranda and criteria, and were passed or failed according to how well they mastered the knowledge (Du Pre, 2000:6). Du Pre above argues that in the assessment of outcomes based learning; knowledge; skills and adherence to specific processes as well as the achievement of outcomes are achieved. In this way, assessment became part of the learning process as well as a method of gauging success.

Out of the many methods in which educational assessments could be performed, formative assessment was used to help find out which of the learners or which set of the focus group needed special help; this provided valuable feedback regarding the techniques used. Learners were regularly asked to comment on the course or instructions and proceedings of each class encounter. Summative assessment was on, the other hand, used to establish if the outcomes of

the project used as a case study (i.e. student's village) were achieved. It was used to measure learning skills and knowledge in identifying the problem at the student village. The results of the learner assessment were allocated marks, which counted towards their year credits. Continuous assessment was used to continuously update the performance of learners.

3.5.1.5 Conclusion

It is submitted that implementing and assessing assignments and projects through individual learners submitting themselves to discuss the problems and ideas generated surrounding solving the electrical power problem, yielded the expected results. This became evident from the comments made by the focus group. In this way, it was possible to assess cognitive, affective, psychomotor and social domains, from the said comments. At the end of the project, learners were able to demonstrate their knowledge and ability to apply theory gained from the class and applied to the assigned project. Learners showed the ability to analyse and evaluate different and available options to solve the problem.

Finally, the results of the year/semester entry marks and final examination marks were analysed. The fact that there was an overall variance of 1% between the semester entry marks (EM) and the final marks (FM) could have been due to the effectiveness of individual to peer or cooperative interaction, with the researcher acting as a mediator or facilitator. With the establishment of action learning sets, it was possible to leave the learners to proceed on their own with little intervention from the researcher. A comparison of the same learners attending different courses offered by different lecturers provided further evidence of the impact of the intervention.

It was concluded that assessments presented in this chapter helped develop independent judgment, critical thinking, and decision making among the learners and the researcher. As supported by Gibbs, (1994:205) critical thinking, reasoning and problem solving skills are applied in cooperative interaction with the learners. The aim was to instill attitudes and values that guide the learners' behaviours outside of the classroom, alternative perspectives and viewpoints with which to think objectively, and an integrated identity that could reduce contradicting thoughts and actions and higher thought processes.

3.5.2 Evaluation of Teaching Performance

3.5.2.1 Introduction

Evaluation is used as a process by which effects and effectiveness of teaching can be determined (Sieborger and Macintosh, 2000:5). As shown on Table 2-4 of chapter two, a performance evaluation of the researcher by 37 learners from the focus group was undertaken at the end of the semester.

3.5.2.2 The Results

It was observed that although the institution requires that the learners should evaluate academic staff, this has not been enforced as evident from the learners who argued that, because nothing had been done about evaluations made in the past, they saw no purpose of the exercise. Realising their concern, the researcher convinced the learners of the importance to provide the feedback, especially for the purposes of the study. An agreement was reached where 37 learners from the focus group completed a questionnaire to evaluate the researcher's teaching performance.

The results obtained in terms of Table 2-4 of chapter two, were analysed in against the remarks "very poor to poor ratings and strong to very strong" (as reflected in Table 3-7). The results of very poor to poor were regarded to imply "weakness" and strong to very strong were construed to mean the strength regarding teaching performance. For convenience, only the first four significant results relating to the weaknesses and strengths were commented on. The focus group gave a weakness rating of 27% for not providing teaching aids, 19% for not writing clearly on the board, 17% for not giving effective feedback to individual learners and 15% for making constructive remarks to learners. With regards to the strengths, the focus group gave a rating of 85% for enthusiasm about the subject, 83% for involving learners in relevant questions, 80% for preparation and organisation of classes and 74% on asking learners relevant questions. It was observed in Table 3-7 that the average overall weakness was 8% while the strength rating was 61%. The focus group also made additional remarks as depicted in Table 3-7.

Table 3-7: Results Of The Teaching Performance Evaluation Questionnaire

No	Remarks	Very Poor	Poor	Total	Average	Good	Very Good	Total
		1	2	(1+2)	3	4	5	4+5
1	Knowledge of subject	0%	3%	3%	30%	27%	41%	68%
2	Speaking clearly and intelligibly	0%	9%	9%	29%	43%	20%	63%
3	Provides teaching aids	14%	27%	27%	16%	41%	3%	43%
4	Uses teaching aids e.g. OHP, Board, and e.t.c.	3%	3%	3%	32%	30%	32%	62%
5	Enthusiastic about the subject	0%	3%	3%	12%	52%	33%	85%
6	Preparation and organization of classes	0%	0%	0%	20%	31%	49%	80%
7	Writing clearly on the board	14%	19%	19%	38%	22%	8%	30%
8	Setting clear outcomes	3%	9%	9%	46%	34%	9%	43%
9	Asking learners relevant questions	0%	0%	0%	26%	26%	49%	74%
10	Involving learners relevant questions	0%	3%	3%	14%	39%	44%	83%
11	On time for start and finish of lecturers	0%	6%	6%	25%	33%	36%	69%
12	Using relevant examples	3%	5%	5%	24%	51%	16%	68%
13	Giving effective feedback to individual learners	6%	17%	17%	33%	31%	14%	44%
14	Marking and returning student work promptly	0%	11%	11%	38%	30%	22%	51%
15	Making constructive comment on student	3%	15%	15%	29%	24%	29%	53%
	Average Total	16	46	8%	148	183	144	61%

Please add any comments you would like to make about my teaching style or programme in general

- Good
- Good but too fast
- Be fair with learners behaviour
- Give explanation than questions
- Good but there must be hand-outs
- Follow the study guide chapter by chapter
- Keep on making examples on the subject

3.5.2.3 Discussion

Assessments are similar to evaluation and sometimes the words mean the same thing. Evaluation, however, refers to something bigger than assessment; therefore assessment is one part of evaluation (Sieborger and Macintosh, 2000: 5). Beaty (1999:7) argues that, no matter how expert one is in the discipline or profession one is teaching, teaching can still be a daunting prospect. One might ask oneself “will the learners learn? What are their needs and does one meet

them?” There can be many questions, but the bottom line is that no one can confidently confirm what the learners think of their educator until their views are solicited. This is what most authors refer to as a process of reflection, observation and generalisation by recognising patterns within the complexity of our experience. In the circumstances, an effective method of gaining student feedback was important for the researcher’s reflection and means of improvement towards the implementation of innovative approach desired in the study. Reflection can be regarded as a reference to the various ways in which one can better understand one’s profession.

There are two broad questions that need to be asked before an evaluation was conducted. The first question concerned asking what the purpose of the evaluation was and the second was determining who of the audience would be evaluated. Beaty (1999:18) as an example set out five common purposes of assessment (evaluation). These are:

- a) *Assessment of the teacher for professional improvement*
- b) *Assessment to determine the teacher's fitness for promotion*
- c) *Assessing the teacher in order to improve the school*
- d) *Assessment in connection with accountability*
- e) *Assessment of the teacher's performance in order to improve learning*

In the study, the target was a), c) and e). This was achieved as part of continuous evaluation conducted during the semester and summative evaluation through the focus group’s evaluation of the researcher’s teaching performance. This was in line with Farrant (1991:206) who argues that no period of teaching is complete without some form of evaluation. This was further in support of Sieborger and Macintosh’s (2000:64) argument that, although the idea of payment by results for teachers was abandoned long ago, teachers are still often judged, formally or informally, by their learners and colleagues on the basis of assessment of their performance.

Under these circumstances, learners can contribute very important information to an evaluation of one’s teaching. They can tell one about their experiences and about their responses to it. They can inform one how much was new to them and how much they have heard before and so on (Beaty, 1999:20). Similarly, and as part of the study, the focus group’s feedback helped to structure the researcher’s effectiveness in teaching and alter the pace and content to better match the learners’ needs towards entrepreneurship education.

For the above reasons and whenever feedbacks were received from the learners, it was the researcher's policy to respond to them as appropriately as possible. Feedback formed part of communication between learners and the researcher and is most effective when carried out regularly as a natural and continuing aspect of the teaching and learning environment. For example, where the learners' response indicated there was poor performance on the part of the researcher with regard to the provision of teaching aids, writing clearly on the board giving effective feedback to individual learners, the researcher took it upon himself to respond as honestly as possible. A particular instance was where the researcher is aware of his writing problems, therefore explained to the learners that the problem dated back to school age. Attempts were however made to use alternative resources such as an overhead projector, to present and display prepared key points on the lesson.

The learners also remarked about the researcher not being strong at providing teaching aids. This submission was found to be relevant, as teaching aids such as laboratory test equipment, computers and others were sometimes difficult to obtain. The complaint was evident from the absence of laboratory equipment needed to perform some fundamental tests required by the syllabus. The resignation of a laboratory technician who could, as part of his function, perform some of the tests requested by the learners was also significant. The researcher nevertheless took the learners to places where such equipment was available.

3.5.2.4 Conclusion

It was concluded that the feedback from the learners provided the researcher with information for reflecting on what they were comfortable with and what they were not. These were considered as researcher's strength and weaknesses. On the other hand, the learners' attitudes, responses and feelings provided the researcher with information on where to strengthen one's weak areas. This served as a benchmark from which a plan for change or improvement could be made. It was generally concluded that the feedback provided valuable interaction between the researcher and the learners, therefore an activity that will form part of future teaching programs.

3.6 General Conclusion

The objective of this chapter was to establish whether assumptions made in chapter one, namely changing from traditional teaching and learning techniques to innovative approach at DEE of ECT, would prepare the learners to become entrepreneurs of tomorrow, and whether this could be achieved. To achieve the objective, the groups were interviewed and allowed to express their perceptions about entrepreneurship education as part of their curriculum. Secondly, learning styles that would help learners understand their areas of weakness and strengths were established. This helped them understand their learning styles in order to make a transition to higher levels of personal and cognitive functioning. Thirdly, the impact of revised learning and teaching approaches were assessed and evaluated. Finally, this chapter showed that collaboration with other stakeholders led to entrepreneurial opportunities, which in turn will create job opportunities for the communities in this province.

4 CHAPTER 4: CONCLUSION AND RECOMMENDATIONS

4.1. Introduction

The aim of this chapter was to give a summary, conclusion and recommendation relating to the study. The summary presented herein discussed the main findings obtained from the previous chapters and their significance to the study. Conclusions were drawn from the findings of the study. Finally, based on the conclusions, recommendations and the implementation thereof are presented.

4.2. Summary

In chapter one of the study, the problem of unemployment in South Africa, especially the Eastern Cape Province, was identified. The impact of such high levels of unemployment and the effect it will have on the future of learners at the Technikon was discussed. Consequently, the government's mandate to schools and tertiary institutions to offer entrepreneurship education as part of the curriculum gave rise to this study. Lessons learnt from other institutions and countries were presented. Finally research objectives and the focus group were identified. Approaches of achieving the identified objectives were dealt with in chapter two.

Chapter two dealt with the chosen research method used to deal with each research goal. Data collecting methods and its analysis were identified and discussed. Given the assumption about changing from traditional learning and teaching methods in order to meet entrepreneurship education curriculum requirements, action research was considered as an appropriate research methodology. Data collection techniques in the form of interviews, questionnaires, video recordings, learners' assessments and evaluation were identified as suitable for the study. To justify collected data from the focus group, alternative sources such as the comparison group and entrepreneurship-training candidates were used as a triangulation process. To verify and obtain detailed information on data obtained by means of interviews, questionnaires were used.

Chapter three was targeted at presenting and discussing results obtained from the data. The

following significant findings in respect of each objective of the study were made.

4.2.1. Entrepreneurship Education

Table 3-1 of chapter three presented the results of this inquiry. The results showed that most learners from the focus group were in favour of entrepreneurship education. The comparison group on the other hand did not support the idea of entrepreneurship education as part of the curriculum. The study also showed that entrepreneurship-training candidates supported inclusion of an entrepreneurship curriculum into the DEE. Finally, on average, the majority of learners that participated in the study support inclusion of entrepreneurship education as part of the DEE curriculum.

4.2.2. Learning Styles and Teaching Approaches

4.2.2.1. The Preferred Learning Styles

The results in respect of learners' preferred learning styles showed domination of reflectors and pragmatists than other learning styles. To capitalise on the reflective and pragmatic styles and at the same time strengthen the weak activist and theorist styles in respect the focus group, the assigned experiential learning project at the student village to investigate, analyse, evaluate and apply theory gained from their studies to solve the problem was used. Learners formed action-learning sets where each set was required to compile and present a report in written and power point presentation forms. The objective was to promote and encourage all four Kolbian learning styles. The feedback showed an improvement in participation of all learners, except for a few negative incidents. These incidents provided an opportunity for the researcher and the focus group to deal with the individual cases collaboratively. The overall feedback, however, was positive, as is reflected in Annexure 3-3 of the report.

The project also provided an opportunity where individuals from each set were able to suggest how problems could be solved whilst others were listening. In turn, other members of the set would suggest how they see the solution; in this way peer assessment from set to group level was

encouraged and promoted. It was generally concluded that only two of the four learning styles were noticeable.

4.2.2.2. Preferred Learning and Teaching Approaches

As alluded to in chapter three, a good teaching system aligns teaching methods and assessment to learning activities, stated in the objectives, so that all aspects of this system are in accord with supporting appropriate student learning (Biggs, 1999:483). For this reason, experiential approaches to learning and teaching were considered to meet these objectives. The results showed that most learners from the focus group and the entrepreneurial training candidates preferred an innovative teaching approach. On the average, learners preferred the innovative learning and teaching approach. This was generally seen to indicate, although by a small margin, good prospects for changing from traditional to innovative learning and teaching approaches.

4.2.3. Establishment Entrepreneurship Experiential Training

The objective of this investigation was to solicit partnership with an industry where learners who have completed their S4 theoretical and electrical engineering practices 1 and 2 (P1 and P2) will be trained as entrepreneurs. The results of the interviews with the Minister of Minerals and Energy and the Chief Director: Planning and Strategic Development Office of the Premier led to contacts and interviews with a service provider in the Amatola DC 12 and OR Tambo District EC 157, called Renewable Energy Africa. A collaborative agreement with REA as ECT's industry partner was concluded, where after, learners who aspired to become entrepreneurs were invited to apply. Twenty-seven (27) learners have since been interviewed and a selection of ten successful candidates completed. The partnership has committed to train selected candidates to become entrepreneurs.

4.3. Conclusion

It was concluded from the study that the objectives of the study were achieved as follows:

- a) It was possible to establish that learners had positive perceptions about entrepreneurship

- education as an integral part of the DEE curriculum;
- b) Establishing learning styles contributed to improved learning and teaching approaches. The improvement was only recognisable from the focus group and entrepreneurship-training candidates. The results could be attributed to motivation and exposing these groups to innovative learning and teaching approaches.
 - c) It was therefore possible to conclude a collaboration agreement between ECT and REA where learners from DEE interested in entrepreneurship, could be exposed to training as entrepreneurs.

Based on the objectives of the study, the following specific conclusions could be drawn:

- i. The findings on the learners' perceptions of entrepreneurship education endorsed the need to introduce the program. Support could be found from the focus groups and entrepreneurship experiential training candidates.
- ii. An investigation into the three groups of learners showed that the majority of learners have preferences for one or two learning styles that is the reflector and pragmatist styles..
- iii. Understanding learners' learning styles can help identify their areas of weakness, thus giving an opportunity to work on becoming more proficient in teaching methods. It also helps realise learners' strength and weaknesses and that additional attention be paid to tasks which fall outside their natural experiences. It further helps learners understand their learning styles, and thus make the transition to higher levels of personal cognitive function.
- iv. Relinquishing the traditional teaching and learning approaches received strong support from learners that participated in the study.
- v. The idea of collaboration with an industry where, learners interested in becoming entrepreneurs, could be exposed to entrepreneurship education, was supported at national to local government levels. Support was also received from management of ECT, REA and prospective candidates, as was evident from the number of applications received.

4.4. Recommendations

On the basis of the results obtained in chapter three and the summary of the main findings submitted in this chapter, it is considered appropriate to recommend the following general and specific factors towards the establishment of an entrepreneurship culture at ECT:

4.4.1. General Factors

It is recommended that entrepreneurship curriculum in the DEE should be implemented based on the following considerations:

- a) Lecturers should be encouraged to assess and motivate learner's entrepreneurship skills and to consider it as a career choice.
- b) Lectures should be trained to conduct an assessment of the learners' learning styles.
- c) Lectures should design and implement teaching methods aligned with learners' learning styles and learning approaches that promote entrepreneurship among them.
- d) Lecturers should as far as practicable be encouraged to solicit and form collaboration with industry partners. This has a twofold advantage firstly, learners can undergo entrepreneurship experiential training in the various disciplines and secondly, such collaboration could be used to keep abreast of the latest developments in that field. Such training should be directed at encouraging entrepreneurship in those learners who may wish to become entrepreneurs.
- e) Finally, it is recommended that a specific curriculum presented in the section below be piloted in order to expose learners that have applied for entrepreneurship experiential training under the ECT/REA agreement.

4.4.2. Specific Factors

It is recommended that, as an interim measure, selected entrepreneurship candidates be registered with TSA to undertake further studies that include entrepreneurship courses presented below. Arrangements have been thus been made with TSA that funds applied for this purpose be paid to this institution while an approval to offer the course by ECT is being solicited. Selected learners

will be required to take the following entrepreneurship subject as part of their Bachelor of Technology (B Tech) degree.

4.4.2.1. Entrepreneurship IV Course Content

a) Module A: Entrepreneurship And How To Establish Your Business

The objective of this module is to teach learners to test the viability of their business idea, to draw up a business plan and to establish their own enterprise successfully. This is done only after they have been given guidance on critically examining themselves as well as the environment in which the enterprise will function.

Important:

- i. Learners will use their own original business idea. Their business plans will be related to their field of study. For example, electrical engineering learners have to plan a business in their specific field of engineering.**
- ii. No business plans of existing franchise organisations may be submitted.**

b) Module B: Financial Management For A Small Business

The objective of this module is to teach learners the basic principles of financial management in the small business enterprise. They will also have the opportunity to apply the principles of financial management for small business to their own business.

c) Module C: Marketing For A Small Business

The objective of this module is to teach learners to market their own enterprise successfully. This is done by teaching them how to draw up a marketing plan for their enterprise. The marketing plan contains all the marketing information for the enterprise – a marketing analysis, the target market, objectives, marketing strategies, action programmes, budgets and control measures.

d) Module D: Management Of A Small Business

The objective of this module is to teach learners to manage their own enterprise successfully. This is done by teaching learners the relevance and importance of the major business functions necessary for effectively managing an enterprise.

e) Module E: The Project

The project entails a proposed new enterprise, new product, service or a business project, which learners need to investigate and use in their assignments.

4.4.2.2. Assessment

The presentation of the project replaces the annual written examination and takes place in the normal examination period. Learners will be informed with regard to the date and time of the presentation. The project includes the following:

a) A formal presentation on paper, not exceeding 20 pages

The formal presentation should be in the form of a final proposal of the learner's planned enterprise and should contain all the important and relevant information to enable the reader to have a clear indication of the focus, objectives, strategies, planning and needs of the enterprise. Summaries of their marketing and financial plans should form part of the business plan and should be included in the final project.

A 30-minute oral presentation to a panel – 20 minutes for presentation and 10 minutes to answer questions from the panel.

b) The oral presentation

The oral presentation will be on the above information. The panel will include the examiner, the

moderator, a person from a financial institution and an expert in the field of the proposed enterprise.

c) Additional Assessment

In addition to the examination purpose, learners will be able to use the project in the following ways:

- i. As an application for finance for the proposed enterprise. (This is one of the reasons for including a person from a financial institution on the panel.)
- ii. To gain inputs from experts in the field of the proposed enterprise, e.g. technical, operational or business-related.

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b) Annexure 3-2: Report Feedback Agreement

ELECTRICAL		Protection	08-04-2002
ROSWARDI S.	S.	2000175	<i>[Signature]</i>
BEBIZZA B.	B.	2002158	<i>[Signature]</i>
MALINDI M.	M.	2002205	<i>[Signature]</i>
CANE L.H.	L.H.	2000523	<i>[Signature]</i>
SOTOMELA Z.	Z.	2000338	<i>[Signature]</i>
MAIKELA N.	N.	9900228	<i>[Signature]</i>
KLAUSHE P.	P.	9901619	<i>[Signature]</i>
NTOZINZIMA M.	M.	9901696	<i>[Signature]</i>
MBIKO C.	C.	9901522	<i>[Signature]</i>
MAKUPULA Z.	Z.	2000502	<i>[Signature]</i>
Ndaba P.	P.	9901508	<i>[Signature]</i>
SOMLENZE N.	N.	2002156	<i>[Signature]</i>
NEOKHANA S.	S.	9901678	<i>[Signature]</i>
Tshaka NR	NR	9930129	<i>[Signature]</i>
DLEPU N.C.	N.C.	9801672	<i>[Signature]</i>
Dambinye U.	U.	2001451	U. Dambinye
MAZIKU A.	A.	2002296	<i>[Signature]</i>

Assessment for test 2

A The class decided that the next assessment shall be in the form of presentation. This has been achieved by means of secret ballot vote of 11:6

B The following presentation format will be completed each group must design. The design must reflect the following. The selection of appropriate transformer was selected. (i) The type of conductor / size used. (ii) The type of protection used for MV/LV. (iii) The types of protection used for MV/LV. (iv) Short circuit conditions. Short circuit

c) Annexure 3-3: Group Feedback

25/05/02

LESSONS	LEARNED
GROUP A :	
Team work is advantageous	
Shared information	
CONSTRAINTS :	
Fighting the between group members	
Individual behaviour	
lack of ^{co-operation} contribution from some members.	
GROUP B :	
Being able to work under pressure	
which is required of engineers -	
Co-operation in the group	
CONSTRAINTS:	
Time needed to reach agreements/	
decisions.	
Initial Mind sets from those who've	
been exposed to the course before.	
GROUP C :	
Sharing information and ideas	
Co-operation in the group	
CONSTRAINTS :	
Non-contributors within the groups	
GROUP D :	
NO - COMMENT	
GROUP E :	
Shared info , commitment ,	
enthusiasm.	
DISADVANTAGE :	
Some members tend to relax	
GROUP F :	
Absentism from some	
members	

d) Annexure 3-4 Rea Correspondence

Komane Godfrey Moeketsi
P.O. Box 891
Randburg,
Phone: (011) 789-6262
Fax: (011) 789-3005
Komane Godfrey Moeketsi
P.O. Box 891
Randburg,
Phone: (011) 789-6262
Fax: (011) 789-3005

Renewable Energy Africa (Pty) Ltd

Renewable Energy Africa (Pty) Ltd

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To:	Mr Mlungisi Sitshinga	From:	Godfrey Moeketsi
Fax:	(043) 726-7144	Date:	February 5, 2003
Phone:	(043) 748-2538	Pages:	1
Re:	Linkage Proposal between ECT and REA	CC:	Prof M. Mazibuko

☐ Urgent ☒ For Review ☐ Please Comment ☐ Please Reply ☐ Please
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Dear Mr Sitshinga:

SUBJECT: LINKAGE PROPOSAL BETWEEN ECT AND REA

Thank you for your document of August 27, 2001 – wherein you put forward proposals on our intended future collaboration. I wish to make it known to you and your Institution that we feel greatly privileged to be in a position where we are going to jointly tackle the programme.

I have mentioned to you telephonically that this project should be getting off the ground as early as the beginning of October 2001. Obviously we need to get together to finalise all the necessary detail on how we are going to function as a team. Previously, I mentioned that we were in the formalisation stage of our relationship with RE Developments (Pty) Ltd, who are going to be our technological vendor in the consortium.

REA is very keen to use some of your facilities on your grounds. This situation will benefit both REA and the learners. Initially we would require a floor space of about 250 square meters for storage. This matter will be discussed in greater detail in the near future, with yourselves. I plan coming to East London in the next two weeks, before you go to the United States. In the meantime I will keep you informed of any developments.

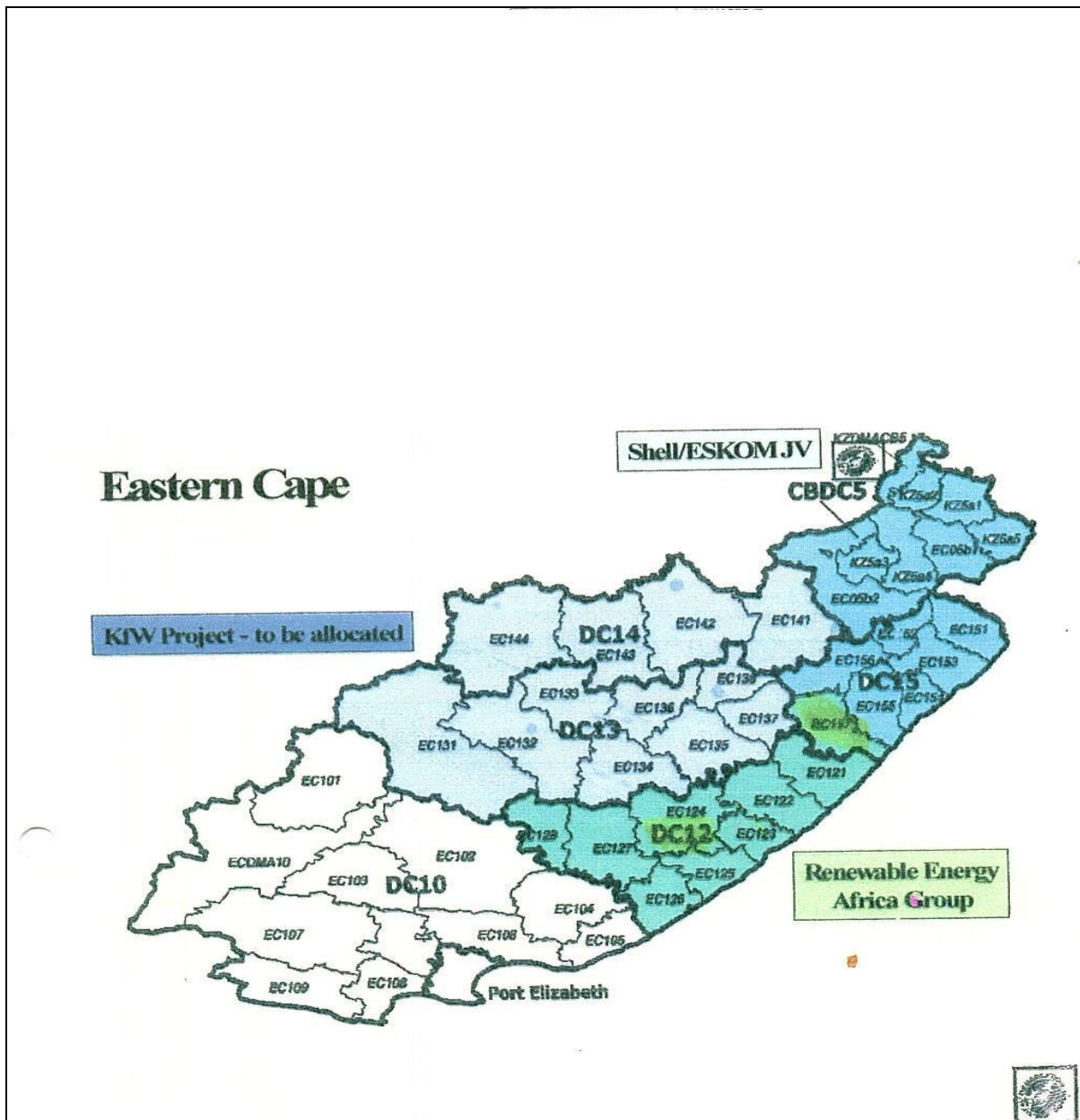
Best regards.

Godfrey Moeketsi

e) Annexure 3-5: Study Guide and Assessment Dates Agreements

STUDY GUIDES			
ELECTRICAL DISTRIBUTION 3			
NB Anybody who take additional study Guide will be deducted 10% 02 May 2002			
10. MAFU M.B.	20111217		M. Mafo
1. Tshaka N.R	9930129		N. Tshaka
2. Mofuya K.	20110437		K. Mofuya
3. GCEW L.	20110857		L. Gcew
4. MAFUSHANA M.N.	20110739		M. Mafushana
5. Mkonjiswa A.	20110875		A. Mkonjiswa
6. MKONDWENI L.W	2002421		L. W. Mkonjeni
7. Mente S	20111118		S. Mente
8. NYANASE M.	20110765		M. Nyanase
8. MPONWANA S	20110065		S. Mponwana
EDST 3/0	02 May 2002		
1. Mofuya K.	20110437		K. Mofuya
2. Tshaka N.R	9930129		N. Tshaka
3. Ntenklozi N.	20110840		N. Ntenklozi
4. GCEW L.	20110857		L. Gcew
5. MAFUSHANA M.N.	20110739		M. Mafushana
6. Mkonjiswa A.	20110875		A. Mkonjiswa
7. Gwarubana R.B	2000275		R. B. Gwarubana
8. Surany T	20110941		T. Surany
9. NYANASE M.	20110765		M. Nyanase
10. NTONGANA N.	2000142		N. Ntongana
11. Mxabo M.U.	2001937		M. Mxabo
12. LUBISI DINGDING S.J.	2001902		S. J. Lubisi
13. MHLABA M	20110133		M. Mhlaba
14. GOSIHE L.A	9801532		L. A. Gosihe
15. Mzi'u C.	20110330		C. Mzi'u
16. MQAZANA U.D.Z	9901580		U. D. Z. Mqazana
17. MAGWINDANE M	9901841		M. Magwindane
18. Zoko S.H	2000314		S. H. Zoko
19. ANANTHIA			

f) Annexure 3-6 Rea Concession Area



g) Annexure 3-7 Letter from AEDC

From: "Alternative Energy Dev. Corp" <rogi@mweb.co.za>
To: <Mlungisi@btech.tktech.ac.za>
Subject: **WG: Collaboration**
Date sent: Wed, 16 Oct 2002 06:28:07 +0200

Dear Mr. Sitshinga ,
Thank you for your e-mail and the telephone conversation yesterday. We are as well excited to have the opportunity to undertake such a rewarding and great project in the Eastern Cape area. As mentioned will this alternative energy project not only enhance the quality of life for many thousands of people forever , but it will create long term employment for hundreds of people in the rural areas , with advanced education in an new technology and other practical skills. The ratio of employment gender is very much in favour of the female , especially in the very rural areas , as to offer an income for these women . Men will receive an advanced education to fuel cell technician and later run their own service shops as owners and entrepreneurs. We also promote the employment of physical handicapped people, which can demonstrate their value to society through our practical training program, and earn of course also an income. We have a huge success with these people in our project in Natal , where we have 3 handicapped people in the team and they are performing with an excellent job quality.

It will be our intention to work very closely with your fine technicon and to let you take an active and leading role in the structuring , monitoring and educational aspects of our project , which we intend to start in November this year.

For this purpose I suggest a meeting to be held at your technicon , with our Mr. Moeketsi and myself. The purpose would be to form a strategic plan for the implementation of the project , the involvement of your technicon and the structure of a budget for the next 2 years. Thanking you for your keen interest and support to this project , I remain for now with best regards ,

ROLF PAPSDORF

-----Ursprungliche Nachricht-----

Von: Mlungisi@btech.tktech.ac.za [<mailto:Mlungisi@btech.tktech.ac.za>]

Gesendet: Dienstag, 15. Oktober 2002 13:23

An: rogi@mweb.co.za

Betreff: Collaboration

Dear,

My details as per our discussion.

Awaiting your response.

Regards.

MM Sitshinga

h) Annexure 3-8: Collaborative Agreements



EC Technikon in R375m solar panel deal

By Samkelo Ngwenya

EAST LONDON -- The Eastern Cape Technikon yesterday secured a R375million milestone deal to install solar panels in rural Transkei. The five-year project signed with Renewable Energy Africa (REA) will see electrical engineering students install the panels and train communities to maintain the system.

"This is an innovative partnership which will involve our students as well," said senior engineering lecturer Martin Sitshinga.

Students are expected to be trained to design basic electric circuits and transfer their skills to the communities.

"We hope that the programme will not only provide resources for us but also empower students to enrich the lives of the rural community in the Eastern Cape," said Sitshinga.

The signing agreement came after a three-way partnership between the technikon, Eskom and Texas Southern University in the US.

Last year about 1300 Eastern Cape schools had solar panels installed. Success in the Umtata area and the OR Tambo municipality saw the technikon clinching a deal with REA with the possibility to expand the programme.

"This is a tremendous step towards introducing an educational system that is entrepreneurial and beneficial to our communities," said engineering faculty dean Phillip Boni.

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BIG MOMENT: Eastern Cape Technikon vice-chancellor Temba Mjoli and Renewable Energy Africa managing director Godfrey Moeketsi sign an agreement which will see Technikon students installing solar panels in rural Transkei. Engineering faculty dean Phillip Boni (standing) looks on.

Picture by ALAN EASON

i) Annexure: 3-9: Minister Launches Solar Power for Rural School



	<p>Solar power for schools</p> <p>By Zama Feni</p> <p>EAST LONDON -- The European Union this week launched a solar electrification scheme that will eventually benefit about 500 village schools in the Tsolo district, according to Eskom spokesperson Letitia Ndema.</p> <p>The EU has provided R96 million for solar electrification and the purchase of related equipment aimed at rural schools in the Eastern Cape and Northern Province.</p> <p>Energy and Mineral Affairs Minister Phumzile Mlambo-Ngcuka, Education MEC Stone Sizani, EU delegates John Paul and John Michel and Eskom officials witnessed the installation of audio-visual equipment and the non-grid electrification in Tsolo.</p> <p>Non-grid electrification is being provided in areas outside Eskom's five-year plan for electricity provision.</p> <p>Schools in Elliotdale, Mqanduli, Qumbu and Engcobo will benefit from the scheme.</p> <p>"This equipment will make a considerable contribution towards the teaching and learning which takes place in rural schools, far from the mainstream of education," Mlambo-Ngcuka said.</p> <p>The equipment for the schools comprises TV sets, videocassette recorders, decoders and satellite dishes, she said.</p> <p>"These will enhance the fluency of communications with national and international education centres and schools."</p>	
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Mlambo-Ngcuka urged schools to share the equipment with the surrounding communities, especially those offering adult basic education and after-hours courses.

"Our long-term intention is to bring computers to the schools, but the acts of vandalism make things difficult for us."

Sizani praised the EU for its generosity in providing the learners with equipment to help teachers provide first class education.

Michel said the audio-visual equipment should last about 20 years if properly maintained.

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j) Annexure 3-10: Correspondence between the research and the Minister of Minerals and Energy.

From: Martin Sitshinga [mlungisi@btech.tktech.ac.za]
Sent: Friday, May 10, 2002 10:35 AM
To: Hon Minister Mlambo-Ngcuka
Cc: Neliswa Magubane
Subject: Proposal for collaboration on alternative energy

I refer to the Minister's visit to the Eastern Cape (Tsolo and Qumbu) and the efforts by DME to provide electricity for all including rural communities. Recent announcements about German support on alternative energy are also noted with enthusiasm.

As indicated during the Hon. Minister's visit, Eastern Cape has identified alternative energy as one of the area that can be used to meet her mission statement, namely:

- i) Providing appropriate, technological, career-oriented education in co-operation with commerce, industry, the government and the community;
- ii) Providing quality teaching, research, development and community services sensitive to needs and trends;
- iii) Producing graduates with entrepreneurial spirit, good work ethics and responsible leadership.

In the circumstances, the Eastern Cape Technikon (ECT) wishes to assist the government and its graduates in the research, designs, installations and maintenance of alternative energy in the Eastern Cape.

This proposal will be supported by International linkages between ECT, Texas Southern University, Houston, USA, Coventry and Greenwich Universities in UK.

To this end, more than twenty ECT male and female students (see attached) have received training on solar technologies. The collaboration has seen international visits such as in USA and UK by Eastern Cape staff members as an exchange effort.

ECT therefore proposes to:

- a) Engage in feasibility studies to establish customer needs
- b) Produce Preliminary design
- c) Produce Detailed designs
- d) Document and where necessary adjudicate tenders or
- e) Engage in the actual installations and
- f) Train communities on maintenance

ECT believes that it has the necessary skilled and knowledgeable staff to accomplish the projects.

Our request is therefore to allocate projects or help establish joint ventures with energy providers in the Province. The projects will be undertaken by ECT staff and final year diploma and degree students.

The ultimate objective is to ensure that ECT does not only respond to the needs of the trends but produce graduates who can become entrepreneurs of tomorrow thus promoting socio-economic upliftment in the Province.

Hoping to hear from you soon.

Regards.

Mlungisi Martin Sitshinga.

k) Annexure 3-11: Invitation to Electrical Engineering Students

**EASTERN CAPE TECHNIKON
DEPARTMENT OF CO-OPERATIVE EDUCATION**

**A T T E N T I O N
E L E C T R I C A L S T U D E N T S**

**invitation to become involved in an electrification project
(non-grid), in Amatola District Council (District 12) and OR Tambo
Council (EC 157)**

REQUIREMENTS

- **Preferably completed P1 and P2 (provide proof where applicable)**
- **Preferably Heavy current (but light current may also be considered)**
- **Be prepared to undertake applicable tests.**
- **Be available for interview (If application is successful)**

please note

**Interviews will be conducted on TUESDAY, 28 January 2003, at the East
London Satellite Campus (if successful). Transport will be available for
students travelling from Butterworth Main Campus.**

**Hand in your CV, with latest academic record, to the Co-Op Office
(Butterworth or East London), NOT LATER THAN 12 noon on FRIDAY, 24
January 2003**

**Please ensure that your contact numbers, provided on the CV, are
contactable AT ALL TIMES. Failure to be able to reach you, will render
your application to have been unsuccessful.**

Annexure 3-12: Correspondence between ECT and TSA

----- Forwarded message follows -----

Martin

Thank you for making use of TSA for your project and enrolment of Entrepreneurship students. Your request to make use of the TSA syllabus and tutorial letter is approved and can also serve as guideline for development of your own programme at Eastern Cape Technikon.

Kind regards

Dr Cecile Nieuwenhuizen
Acting Executive Director:
Business Management
Master Technologies Business Administration,
Entrepreneurship and Research Co-ordinator
Tel. +27 11 4713689
Fax. +27 11 4713216
Cell 0834583324
cnieuwen@tsa.ac.za