The impact of the integrated assessment on the critical thinking skills of the first-year Extended Curriculum Programme students in the Department of Management Accounting at the Durban University of Technology

Submitted in fulfilment of the requirements of the Master of Accounting degree in the Department of Management Accounting, Faculty of Accounting and Informatics, Durban University of Technology, Durban, South Africa

Melanie Bernice Cloete (19202151)

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Supervisor: Dr Hari Lall Garbharran (D.P.A)

DECLARATION

I, Melanie Bernice Cloete, declare that this dissertation is my own work. This work has not been previously submitted for another degree. In addition, it is not been concurrently submitted in candidature for another degree. All sources used have been acknowledged in a complete reference.

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Student Name: Melanie Bernice Cloete Date:

APPROVED FOR FINAL SUBMISSION

_____ _____

Supervisor: Dr H. L. Garbharran Date

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“Trust in the Lord with all your heart and lean not on your own understanding. In all your ways acknowledge Him and He will direct your paths.” Proverbs 3:5- 6

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ABSTRACT

Empirical evidence highlighted the problem of underprepared graduates who lack critical thinking skills required in the work environment. Institutions of higher learning have been mandated to provide graduates with these critical thinking skills. However, in order to achieve this mandate, teaching, and, in particular, assessment practices at institutions of higher learning would need to be rethought and transformed.

Integrated assessments that mirror real life situations are particularly useful in the development of critical thinking skills. The purpose of this study is to investigate whether the integrated assessment conducted with the first-year ECP students in the Department of Management Accounting at the Durban University of Technology has enhanced the critical thinking skills of these students.

This descriptive and inferential study employed a quantitative strategy, with a quasi-experimental, pre-test, post-test, non-equivalent group design and it was longitudinal in nature. The target population consisted of two groups: all the first-year students registered on the Extended Curriculum Programme in the Department of Management Accounting in 2014, which was approximately 40 students (experimental group); and all the first-year students registered on the Extended Curriculum Programme in the Department of Financial Accounting in 2014, which was approximately 40 students (control group). All five categories of the Watson-Glaser Critical Thinking Appraisal UK edition were administered to both the control and experimental groups in a pre-test and post-test measure. However, only the experimental group was exposed to the integrated assessment. The aim was to measure the change, if any, in the students' critical thinking skills over a period of time.

The findings revealed a statistical significance in the overall post-test scores in favour of the experimental group. The norm group comparisons also revealed that, after the completion of the integrated assessment, the experimental group's post-test mean scores were higher than the US grade 12 students and were closely matched to the US first year of 4 year colleges. In addition, the experimental group's pre-and post-test mean scores were closely matched to the SA norm group. These results suggested

that the experimental group experienced gains in their critical thinking ability in the post-integrated assessment.

It is, therefore, recommended that integrated assessments, which are based on real world problems, should be conducted in the first year and in subsequent years. It is not always possible for universities of technology to offer cooperative education/ in-service training to all students. Contextualized integrated assessments, therefore, bridge this gap by allowing students to experience workplace requirements without physically being in the work environment.

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LIST OF ABBREVIATIONS

CCFO	Critical Cross Field Outcomes
CELT	Centre for Excellence in Learning and Teaching
DHET	Department of Higher Education and Training
DUT	Durban University of Technology
ECP	Extended Curriculum Programme
IREC	Institutional Research Ethics Committee
ITSS	Integrated Tertiary Software System
JIPSA	Joint Initiative for Priority Skills Acquisition (JIPSA)
QAA	Quality Assurance Agency (QAA)
SPSS	Statistical Package for the Social Sciences
W-GCTA-UK	Watson-Glaser Critical Thinking Appraisal-UK edition

LIST OF TERMS

Critical thinking

Since the W-GCTA–UK edition was used to gauge the critical thinking skills of the first-year Extended Curriculum Programme (ECP) students, the definition presented by these authors was used for the purpose of this research.

Watson and Glaser (2002: 7.1) defined critical thinking as: “(1) attitudes of enquiry that involve an ability to recognize the existence of problems and an acceptance of the general need for evidence in support of what is asserted to be true; (2) knowledge of the nature of valid inferences, abstractions and generalizations in which the weight or accuracy of different kinds of evidence is logically being determined; and (3) skills in employing and applying the above attitudes and knowledge”.

Formative assessment

Formative assessment “refers to assessment that is used to support the student developmentally and to feed back into the teaching and learning process. This suggests that there is a relationship between assessment, learning and teaching, and that assessment informs and strengthens both the teaching and learning process” (Durban University of Technology. Centre for Excellence in Learning and Teaching 2014: 6).

Summative assessment

Summative assessment “means assessment that makes possible total evaluation of the extent of the student’s progress at the end of a module or finite part of the programme. Results of summative assessment may be used to determine whether the student may proceed to the next level of study in a programme” (Durban University of Technology. Centre for Excellence in Learning and Teaching 2014: 7).

Integrated assessment

According to the Durban University of Technology's assessment policy, an integrated assessment refers to " holistic tasks which combine the assessment of a variety of different skills at the same time; assessing a number of outcomes together; assessing a number of assessment criteria together; using a combination of assessment methods and instruments; acquiring evidence from other sources, for example, portfolios, journals, logbooks, supervisor reports" (Durban University of Technology. Centre for Excellence in Learning and Teaching 2014: 6)

CHAPTER 1: CONTEXT, SCOPE AND STRUCTURE OF THE STUDY

1.1 Introduction

This chapter begins by highlighting the importance of critical thinking for institutions of higher learning. The background of the study describes the purpose behind the development of the integrated assessment. The chapter also reveals the problem of underprepared graduates who lack the critical thinking skills which are required in the work environment. It introduces the objectives that will address the broad aim of the study. The research hypotheses and significance of the study are also explored. This chapter also covers the methodology used and outlines the structure of the dissertation.

1.2 Importance of critical thinking for institutions of higher learning

According to Fisher (2011: v) critical thinking is the capability to interpret, analyse and evaluate concepts and arguments. Critical thinking has been cited by Ku (2009: 70) as a core outcome of higher education institutions, both nationally and internationally. This belief was reinforced by Behar-Horenstein and Niu (2011: 25) as well as numerous other empirical studies. According to Norris (1985), as cited by Lombard, K and Grosser (2008: 576), critical thinking is not an educational choice. Kong and Seng (2006), as cited by Lombard, K and Grosser (2008: 576), concurred that students have the right to be taught how to think critically and educators have the moral responsibility to prepare them. These critical thinking skills are essential for learners to become responsible citizens. These skills enable learners to make sound decisions on a daily basis, in the context of their studies; their future workplace as well as their social and interpersonal relationships (Ku 2009: 70).

1.3 Background to the study

Globally, businesses are facing more challenges today through increased competition and technological advancements (TalentLens 2012b: 2). To remain competitive within the global economy, South Africa requires people who can think critically. Employees, who can analyse and evaluate information under pressure, can make better decisions

(TalentLens 2012a: 1). For South Africa to remain competitive within the global market, critical thinking skills must be developed and nurtured.

South African institutions of higher learning have recognised the importance of critical thinking. They have, over the past decade, been transformed in accordance with the constructivist school of thought, which promotes concepts such as lifelong learning, learner-centredness, participative teaching and problem-based learning. Constructivism has been reinforced by the Critical Cross Field Outcomes laid down by the South African Qualification Authority Act of 1995 (South African Qualifications Authority 2006). An important Critical Cross Field Outcome is the ability to recognise and find solutions to problems using critical and innovative thinking. This constructivist approach has been entrenched as the Durban University of Technology's institutional philosophy (Durban University of Technology. Centre for Excellence in Learning and Teaching 2014: 2).

Although the constructivist approach is an entrenched institutional philosophy, the intensified pressure by government to improve student performance at institutions of higher learning has perpetuated teacher-centred classroom and assessment practices (Lombard, BJJ 2008: 1038). According to Jansen (2011), academics have become mere slaves to the subsidy devil. These practices are counterproductive and deprive learners of critical and creative thinking.

Numerous empirical studies have highlighted the inability of graduates to cope with the workplace requirements (McPhun 2010: 1-2; Jansen 2012: 1). This has a major impact on the country's economy. Jansen (2012: 1) noted that there is a vast difference between what a university diploma or degree articulates and what graduates can do in the workplace. There needs to be an alignment of teaching, learning and assessment practices, to enable institutions of higher learning to bridge this gap.

This study will not focus on whether students are taught to think critically, but whether the assessment methods are appropriate in reinforcing these critical thinking competencies. There is a clear relationship between assessment, learning and teaching. These three components are inseparable in the context of academic programmes. Keppel and Carless (2006), as cited by Lombard, BJJ (2008: 1038),

explained that assessment is a component of the curriculum that is the most difficult to transform. Despite this difficulty, it is an important component which informs and reinforces the teaching and learning process (Durban University of Technology. Centre for Excellence in Learning and Teaching 2014: 6). Boud and Associates (2010: 75) concurred that assessment contextualises what students learn and attain. Consequently, improving assessment practices should improve the quality of learning.

Two national studies on critical thinking were conducted in 2008 by Lombard and Grosser. These studies focused on undergraduate students, i.e., first-year education students and used the Watson-Glaser Critical Thinking Appraisal UK edition (W-GCTA) to measure the critical thinking skills of these students. The aim of the studies was to establish the extent to which the outcomes based education system had inculcated critical thinking skills within these students during their schooling career. Both studies revealed the inability of these students to think critically and recommended the use of assessment practices that would enhance critical thinking (Lombard, BJJ 2008: 1040; Lombard, K and Grosser 2008: 575). The major limitation of both these studies was the lack of an intervention to measure the change in the students' critical thinking skills over a period of time.

Integrated assessments consist of numerous tasks that assess a variety of outcomes (Durban University of Technology. Centre for Excellence in Learning and Teaching 2014: 6). An integrated assessment was designed in 2010 for the first-year Extended Curriculum Programme students in the Department of Management Accounting with the support of the Centre for Excellence in Learning and Teaching (CELT) at the Durban University of Technology. This integrated assessment has been implemented from 2011 to date. These students were identified as being underprepared and not being able to manage with the higher education workload, due to their educational backgrounds (Department of Higher Education and Training 2012: 1). The aim of this integrated assessment was to enhance the critical thinking skills of these students and prepare them for subsequent levels of study.

This study will use the W-GCTA UK edition to measure the critical thinking skills of the first-year Extended Curriculum Programme students in the Departments of Management Accounting and Financial Accounting at the Durban University of Technology. It will address the limitations of the two national studies, by using the integrated assessment as an intervention and measure the development of the students' critical thinking skills over a period of time, i.e., pre-and post-integrated assessments.

1.4 Research problem

According to Lombard, K and Grosser (2008: 561), the South African economy can only remain competitive with a workforce of critical, creative thinkers, who can solve problems and make sound decisions. Institutions of higher learning have been mandated to provide graduates with these critical thinking skills. However, in order to achieve this mandate, teaching, and, in particular, assessment practices would need to be rethought and transformed (Boud and Associates 2010).

Higher education institutions are not achieving this directive. This has been revealed by numerous empirical studies, which have highlighted the inability of graduates to cope with the workplace requirements (McPhun 2010: 1-2; Jansen 2012: 1). Osborne, Dunne and Farrand (2013: 1) argued that assessment is the key that will enhance students' employability and close the gap between higher education and the workplace requirements. Integrated assessments that mirror real life situations are particularly useful in the development of critical thinking skills. The purpose of this study is to investigate whether the integrated assessment conducted with the first-year ECP students in the Department of Management Accounting at the Durban University of Technology has enhanced the critical thinking skills of these students.

1.5 Research aim

The aim of this study is to determine if an integrated assessment can enhance the critical thinking skills of the first-year Extended Curriculum Programme students in the Department of Management Accounting at the Durban University of Technology.

1.6 Research objectives

In order to accomplish the above mentioned aim, the following objectives will be addressed:-

1.6.1 To explore critical thinking skills within the higher education context;

1.6.2. To examine integrated assessments within the higher education context;

1.6.3. To identify the relationship between integrated assessments and critical thinking; and

1.6.4. To investigate whether the integrated assessment conducted with the Extended Curriculum Programme students has improved the critical thinking competencies of these students. To achieve this objective, the following sub-objectives will be addressed:

1.6.4.1 To determine the pre-test and post-test critical thinking ability scores of the experimental and control groups, respectively;

1.6.4.2 To assess whether there is a statistically significant difference in the pre-test critical thinking ability scores of the experimental and control groups;

1.6.4.3 To ascertain whether there is a statistically significant difference between the pre-test and post-test critical thinking ability scores of the experimental and control groups, respectively;

1.6.4.4 To determine whether there is a statistically significant difference in the post-test critical thinking ability scores between the experimental and control groups; and

1.6.4.5 To find out which of the critical thinking ability sub-test scores are the best predictors of the post-test overall critical thinking ability score in the experimental group.

1.7 Research questions

The objectives of the study have led to the following research questions, which will delineate the scope of the study:-

1.7.1 What are the critical thinking skills required within the higher education context?

1.7.2 Why are integrated assessments important in the higher education context?

1.7.3 What is the relationship between integrated assessments and critical thinking?

1.7.4 Has the integrated assessment conducted with the Extended Curriculum Programme students improved their critical thinking skills?

1.7.4.1 What are the pre-test and post-test critical thinking ability scores of the experimental and control groups, respectively?

1.7.4.2 Is there a statistically significant difference in the pre-test critical thinking ability scores of the experimental and control groups?

1.7.4.3 Is there a statistically significant difference between the pre-test and post-test critical thinking ability scores of the experimental and control groups, respectively?

1.7.4.4 Is there a statistically significant difference in the post-test critical thinking ability scores between the experimental and control groups?

1.7.4.5 Which of the critical thinking ability sub-test scores are the best predictors of the post-test overall critical thinking ability score in the experimental group?

The research questions 1.7.1 to 1.7.3 were addressed by the literature review covered in chapters 2 and 3. Research question 1.7.4 and its sub-questions, will be addressed by the statistical analysis covered in chapter 5.

1.8 Research hypotheses

The current research is a descriptive study based on hypothesis testing. In terms of the problem statement, the hypotheses developed for the current research study are:

H_{01}: There is no statistically significant difference in the pre-test critical thinking ability scores of the experimental and control groups;

Ha_1: There is a statistically significant difference in the pre-test critical thinking ability scores of the experimental and control groups;

H_{02}: There is no statistically significant difference in the pre-test and post-test critical thinking ability scores of the experimental and control groups, respectively;

Ha_2: There is a statistically significant difference in the pre-test and post-test critical thinking ability scores of the experimental and control groups, respectively;

Ho_3: There is no statistically significant difference in the post-test critical thinking ability scores of the experimental and control groups;

Ha_3: There is a statistically significant difference in the post-test critical thinking ability scores of the experimental and control groups;

Ho_4: The variance in the overall critical thinking ability score on the post-test of the experimental group will not be significantly explained by the respective critical thinking ability sub-test scores; and

Ha_4: The variance in the overall critical thinking ability score on the post-test of the experimental group will be significantly explained by the respective critical thinking ability sub-test scores.

These hypotheses will be tested in chapter 5 using statistical analysis.

1.9 Significance of the study

Although numerous empirical studies have highlighted the link between critical thinking and integrated assessments, South African studies on critical thinking and integrated assessments are limited. The recommendations provided by the national studies were the impetus for the current research study.

According to the Durban University of Technology's assessment policy, an integrated assessment refers to " holistic tasks which combine the assessment of a variety of different skills at the same time; assessing a number of outcomes together; assessing a number of assessment criteria together; using a combination of assessment methods and instruments; acquiring evidence from other sources, for example, portfolios,

journals, logbooks, supervisor reports" (Durban University of Technology. Centre for Excellence in Learning and Teaching 2014: 6). This policy promotes the use of integrated assessments across different levels and within modules (subjects) or in the capstone module. Despite the fact that the DUT assessment policy promotes the use of integrated assessments, this kind of assessment is not widely used at the DUT.

This research is intended to promote the use of integrated assessments in the development of the critical thinking skills of the Extended Curriculum Programme students at the Durban University of Technology. Integrated assessments that mirror real-life situations are particularly useful in showing the link between theory and practice. According to McPhun (2010: 7), if integrated assessments are applied, graduates will be prepared for the realities of the workplace and will certainly hit the ground running.

It is hoped that this study would inform and improve assessment practices at the Durban University of Technology. Students would also benefit directly from improved assessment practices.

1.10 Research methodology

The methodology is the framework used to achieve the aim of the research study. It outlines the following: research design; target population; data collection instrument; data analysis; ethical considerations; and the reliability and validity of the study.

1.10.1 Research design

The research approach was the quantitative method based on deductive reasoning. The study used quasi-experimental, pre-test, post-test, non-equivalent group design. This research design evaluated the impact of the intervention, i.e., the integrated assessment on students' critical thinking skills.

According to Reichardt (2009: 54), this design is not a pure experimental design, but rather a quasi-experimental design, since participants are not randomly assigned to either a control or experimental group. This design required both the groups to undergo a pre-test measure. The intervention, which is the integrated assessment, was then administered to the experimental group only. At the end of the intervention, both groups then underwent a post-test measure.

Both the experimental and control groups were required to complete a common subject, i.e. Accounting Professional Practice in their first year. However, this subject was assessed differently between groups due to their course requirements. The experimental group was required to complete the integrated assessment, which constituted 40% of their year mark, in the subject Accounting Professional Practice. The control group, however, was not required to complete the integrated assessment as part of their year mark requirement for the subject Accounting Professional Practice. Consequently, due to this practical constraint, the control and experimental groups were conveniently and purposefully chosen.

1.10.2 Target population

A requirement of the Department of Higher Education and Training was that only 20% of the student intake for a programme should be placed on an Extended Curriculum Programme. This requirement was communicated to Prof A Bawa, the Vice-Chancellor of the Durban University of Technology, by the Minister of Higher Education and Training, Dr BE Nzimande, in a letter dated 1 June 2012. The student intake for the normal programme in the Departments of Management Accounting and Financial Accounting is approximately 200 students. Consequently, the sample size for the study was restricted to approximately 80 students.

The target population consisted of two groups:

- All the first-year students registered on the Extended Curriculum Programme in the Department of Management Accounting in 2014, which was approximately 40 students (experimental group); and
- All the first-year students registered on the Extended Curriculum Programme in the Department of Financial Accounting in 2014, which was approximately 40 students (control group).

Therefore, this was a census study. According to Saunders, Lewis and Thornhill (2012: 666), a census is the gathering and investigation of data from every group member within the population. It is acknowledged that the current research study focused on a small number of students, which limits the generalization of results.

1.10.3 Data collection instrument

The Watson-Glaser Critical Thinking Appraisal UK edition was used to collect quantitative data. It is a multiple choice test, which consists of five categories that measure the following critical thinking abilities:

- to outline a problem;
- to select relevant information to solve the problem;
- to identify stated and unstated viewpoints;
- to devise and select appropriate and potential models; and
- to make a decision.

All five categories of the test were administered to both the control and experimental groups at two points within the academic year in March and in September pre-and post-integrated assessments. The aim was to measure the change, if any, in the students' critical thinking skills over a period of time. Since data was collected at different points in time, this study was a longitudinal one.

1.10.4 Data analysis

Quantitative data was analysed using the latest version of the Statistical Package for Social Sciences (SPSS) version 22.0, which was released in August 2013.

1.10.5 Ethical considerations

No deception of any kind was used. The Heads of Department were provided with a gatekeeper's permission letter and the research participants were provided with a letter of consent. Data was only collected once the informed consent had been obtained. Student participation was voluntary and the confidentiality and anonymity of students were maintained.

1.10.6 Reliability and validity

The reliability of the W-GCTA UK edition instrument is ensured since this instrument had been previously administered in the South African context and a norm group, therefore, does exist.

The internal validity of the study was enhanced by the following factors:

- The control group and experimental group had been closely matched. Both these groups had been identified as being underprepared and not being able to manage with the higher education workload, due to their educational backgrounds;
- The instrumentation bias was nullified, since the same test was administered to both groups before and after the treatment; and
- The external validity of the study was enhanced by the experiment which reflects the work environment. To enhance the external validity of this study, a pilot test was conducted using the W-GCTA-UK edition practice test and amendments, if any, were implemented.

1.10.7 Delimitations of the research study

A review of the literature uncovered numerous definitions of critical thinking which had evolved over the century. A critique of these definitions revealed a common theme, i.e., critical thinking involves cognitive skills as well as dispositional attitudes (Lombard, K and Grosser 2008: 563; Lia 2011: 2). This study focused on the cognitive skills of critical thinking and not the dispositional attitudes of the first-year Extended Curriculum students in the Departments of Management Accounting and Financial Accounting at the Durban University of Technology. Further to this, the study only explored the assessment of the aforementioned cognitive skills and not the teaching of these skills.

1.11 Structure of the dissertation

The dissertation consists of 6 chapters. A brief summary of each chapter is provided below.

1.11.1 Chapter 1: Context, scope and structure of the study

This chapter contextualised the research study by highlighting the background, problem, research objectives, scope and significance of the study.

1.11.2 Chapter 2: Literature review: Critical thinking within the higher education context

This chapter will review the pertinent literature associated with the dependent variable of the current study, i.e., critical thinking.

1.11.3 Chapter 3: Literature review: The relationship between integrated assessments and critical thinking

This chapter will review the pertinent literature associated with the independent variable of the current study, i.e., integrated assessments, and provide the theoretical framework on both variables that underpin the current study.

1.11.4 Chapter 4: Research methodology

This chapter will discuss the research methodology, i.e., the research design, data collection and analysis and delimitations of the study.

1.11.5 Chapter 5: Statement of findings, interpretation and discussion of the primary data

This chapter will report and interpret the results and discuss the findings related to the research objectives of the study.

1.11.6 Chapter 6: Conclusions and recommendations

This chapter will present the research conclusions and recommendations for practice and for further research.

1.12 Conclusion

This chapter highlighted the importance of critical thinking for institutions of higher learning. It covered the background of the study and described the purpose behind the development of the integrated assessment. The chapter also revealed the problem of underprepared graduates who lack the critical thinking skills which are required in the work environment. It introduced the objectives that will address the broad aim of the study. The significance, delimitations and benefits of the study were discussed. The methodology used and the structure of the dissertation were also covered.

The next chapter focuses on the literature review pertaining to the dependent variable of the current study, i.e., critical thinking.

CHAPTER 2: CRITICAL THINKING WITHIN THE HIGHER EDUCATION CONTEXT

2.1 Introduction

The previous chapter contextualized the current research study by highlighting the background, research objectives, scope and significance of the study. This chapter will review the pertinent literature and discuss the theoretical and conceptual framework that underpins the study. This will be achieved by an in-depth examination of the dependent variable of the study i.e., critical thinking. In addition, objective 1.6.1: to explore critical thinking skills within the higher education context; will be addressed by the literature reviewed in the current chapter.

2.2 Background to critical thinking

Critical thinking has been the focal area of countless empirical studies dating back to the early 1900's. The augmentation of critical thinking skills has been cited as the principle outcome of higher education in numerous empirical studies, both nationally and internationally (Halpern 1998: 450; Halx and Reybold 2005: 293; Lombard, BJJ 2008: 1030; Lia 2011: 4; Barnett and Francis 2012: 201). This principle outcome has not diminished over the years due to technological advances that have led to changes in the workplace. According to Boud and Falchikov (2006), as cited by Thomas (2011: 26), future graduates will be exposed to new situations and will be expected to solve problems that may not exist at present. Swanepoel (1998: 5) identified critical thinking as a powerful enabling factor equipping individuals to deal with change. It is, therefore, important to ensure that students are equipped with the necessary critical thinking skills to ensure that they can adapt to the work environment.

One is not born with critical thinking skills and, according to Angelo (1995:6), as cited by Lombard, BJJ (2008: 1030), these skills cannot be developed merely by maturation. They must be taught and practised, i.e., reinforced with appropriate assessments. This study will not focus on the teaching of critical thinking skills, but rather on how assessments and, in particular, integrated assessments can enhance critical thinking

skills. In order to assess or measure the gains in students' critical thinking abilities, one must have an understanding of what the term means (Halpern 2001: 272; Ku 2009: 71).

2.3 Definition of critical thinking

Although the importance of critical thinking has been acknowledged by numerous empirical studies, the experts in the field have differed in respect of their definition of the term. According to Lia (2011: 4), critical thinking has its origins in three academic disciplines, i.e., psychology, philosophy and education. The epistemological and theoretical viewpoints of these disciplines have had an impact on how they defined critical thinking (Brookfield 2012, as cited by Kahlke and White 2013: 21). An overview of the definitions of critical thinking from the various seminal writings of the experts in the field over the last century are provided hereunder.

John Dewey (1909)

He was an educator and philosopher and is regarded as the father of critical thinking which he referred to as "reflective thinking". He defined critical thinking as "active, persistent, and careful consideration of a belief or supposed form of knowledge in the light of the grounds which support it and the further conclusions to which it tends" (Dewey 1998:9).

Robert Ennis (1985)

He developed two widely used critical thinking test measures, i.e., the Cornell Critical Thinking Test (CCTT) and the Ennis-Weir Critical Thinking Essay Test (EWCTET) with the assistance of his colleagues Millman, Tomko and Weir (Belgin and Sükran 2011: 178). He defined critical thinking as "reflective and reasonable thinking that is focused on deciding what to believe or do" (Ennis 1985:45).

Richard Paul (1992)

Paul is the director of the centre for critical thinking and is viewed as the leader of the international critical thinking movement (Belgin and Sükran 2011: 179). He defined critical thinking as “disciplined, self-directed thinking that exemplifies the perfections of thinking appropriate to a particular mode or domain of thought” (Paul 1992:9).

Peter Facione (1998)

A national Delphi study was commissioned by the American Philosophical Association (APA) in 1988, with the objective of reaching a consensus regarding the definition of critical thinking. Peter Facione was the prime investigator and the panel consisted of 46 experts in the critical thinking field. The definition resulting from the study was “the process of purposeful, self-regulated judgment giving reasoned consideration to evidence, context, conceptualizations, methods, and criteria” (Belgin and Sükran 2011: 180).

Goodwin Watson (1925) and Edward Glaser (1937)

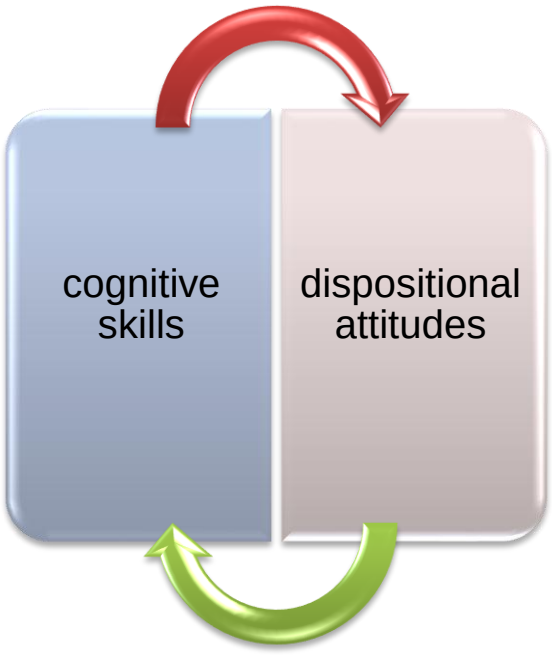
Watson and Glaser developed the Watson-Glaser Critical Thinking Appraisal which has become the most widely used measure of critical thinking in the world (Watson and Glaser 2002: 1.1). Watson and Glaser (2002: 7.1) defined critical thinking as: “(1) attitudes of enquiry that involve an ability to recognize the existence of problems and an acceptance of the general need for evidence in support of what is asserted to be true; (2) knowledge of the nature of valid inferences, abstractions and generalizations in which the weight or accuracy of different kinds of evidence is logically being determined; and (3) skills in employing and applying the above attitudes and knowledge”. Since the W-GCTA–UK edition will be used to gauge the critical thinking skills of the first-year Extended Curriculum Programme (ECP) students, the definition presented by these authors will be used for the purpose of this research.

A critique of the various definitions of critical thinking, as provided by the experts, revealed areas of commonality, i.e., critical thinking is an active process that involves metacognition “thinking about one’s thinking” and skillful reasoning. According to Lia (2011: 2), when designing critical thinking assessments, these assessments should make students’ reasoning evident. The integrated assessment designed for the ECP students required them to draw conclusions and provide recommendations; which made the students’ reasoning evident. The structure and requirements of the integrated assessment designed for the ECP students will be covered in chapter 4.

2.4 Skills underlying critical thinking

Ennis (1985: 46); Lombard, K and Grosser (2008: 563); Facione (2010: 5); and Lia (2011: 2) concurred that critical thinking comprises of two components, i.e., cognitive skills and dispositional attitudes. These components are interrelated in the process of critical thinking (Ennis 1985: 48). The interrelated components of critical thinking are illustrated in Figure 2.1.

Figure 2.1 Interrelated components of critical thinking



Source: Adapted from Facione (2010: 10)

Cognitive skills refer to an individual's mental and or intellectual skills (Clark 2013: 1), while dispositional attitudes refer to their emotions, values, attitudes, motivation, commitments, etc. (Ku 2009: 71).

It is important to identify the key elements of the cognitive skills and dispositional attitudes of critical thinking as these will assist in the designing of appropriate assessments. Lia (2011: 9-10) identified the key elements of the cognitive skills and dispositional attitudes as follows:

Cognitive skills:

- (analysis) analysing arguments;
- (synthesis) using logical reasoning to develop hypotheses; and
- (evaluating and creating) using judgements to evaluate alternatives in decision making or problem solving.

Dispositional attitudes include:

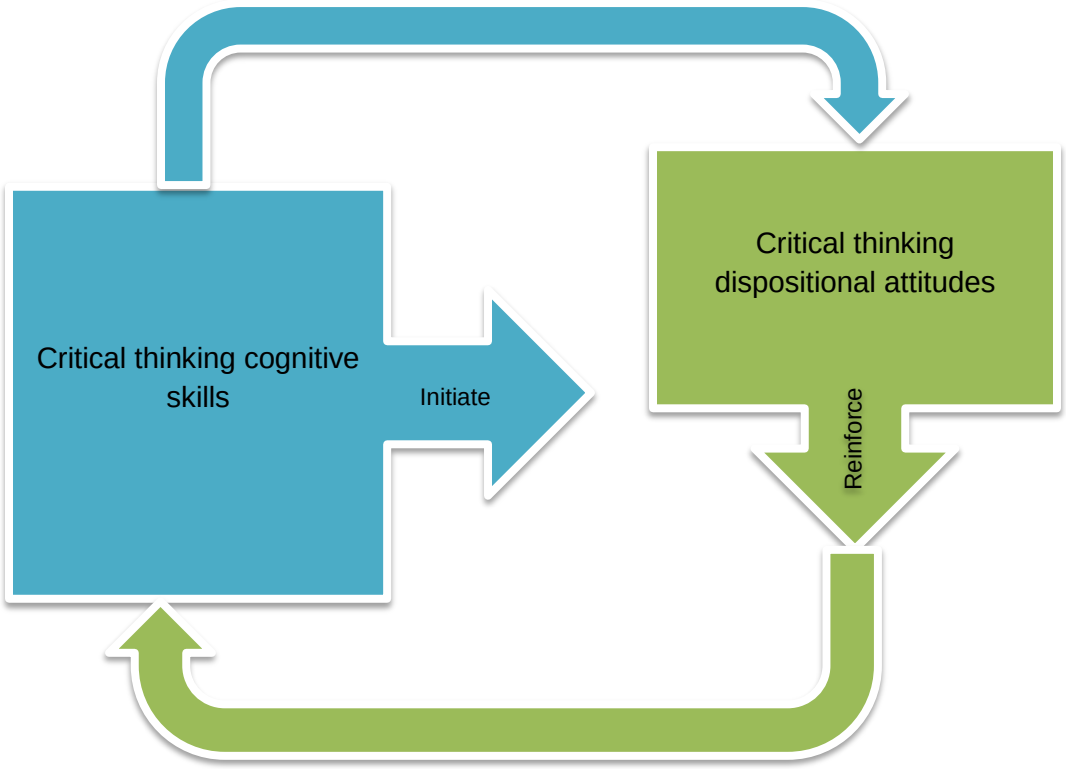
- open and fair-mindedness;
- inquisitiveness;
- a predisposition to seek reason;
- a determination to be informed; and
- a respect for and preparedness to accommodate diverse viewpoints.

Ku (2009: 71) emphasized that the cognitive and dispositional components must be assessed together in order to effectively measure critical thinking performance. The assessment of both the cognitive as well as the dispositional attitudes of the ECP students is beyond the scope of this research study.

This study will focus on measuring the cognitive skills and not the dispositional attitudes of the ECP students. This is due to the fact that the instrument that was used to measure the critical thinking skills of these students, i.e., the W-GCTA- UK edition is a multiple choice measure which does not adequately measure dispositional abilities (Ku 2009: 70). The researcher's decision to use the W-GCTA as well as the structure of this instrument will be discussed in chapter 4.

The APA Delphi study agreed that critical thinking cognitive skills can be taught and the dispositional attitudes fostered (Belgin and Sükran 2011: 181). Paul (1992: 10) argued that, if critical thinking is done regularly, the dispositional attitudes "special traits of mind" will develop over time. According to Halpern (1998: 452), critical thinking is hard work, but if educators consistently expose their students to assessments that require them to use these cognitive skills, then students will develop the required dispositional attitudes over time. The process then becomes cyclical, as the dispositional attitudes reinforce the critical thinking cognitive skills. This process is depicted in Figure 2.2.

Figure 2.2 The interactive and cyclical process of critical thinking



Source: Self-generated

2.5 Critical thinking and Extended Curriculum Programmes

According to Thomas (2011: 28), Australian universities were expected to admit more students who were underprepared for higher education. Similarly, the South African Government Online (2014) indicated that government's target is to increase the number of grade 12 learners, who gain access to higher education, by approximately 78 000 for the period 2013 to 2019. The South African government has also made provision for underprepared students in the form of funding for Extended Curriculum Programmes. Students who have been identified as being underprepared for higher education are placed on these programmes (Department of Higher Education and Training 2012: 1).

The objective of the ECP or foundation programmes is to provide students with the extra support needed for them to succeed in higher education.

Thomas (2011: 26) maintained that the development of critical thinking skills would assist students in coping with the demands of higher education and the work environment. Paul (1992: 23) concurred with Thomas and emphasized that critical thinking results in a genuine understanding of information and not merely the recollection of information. Consequently, the development of critical thinking skills will assist underprepared students in, firstly, coping with subsequent levels of studies and, secondly, with the work place requirements. This study will be investigating the development of the critical thinking skills of the ECP students by means of an integrated assessment. The background to the ECP programmes in South Africa will be covered in chapter 3.

2.6 Models or theories associated with higher-order thinking/ critical thinking

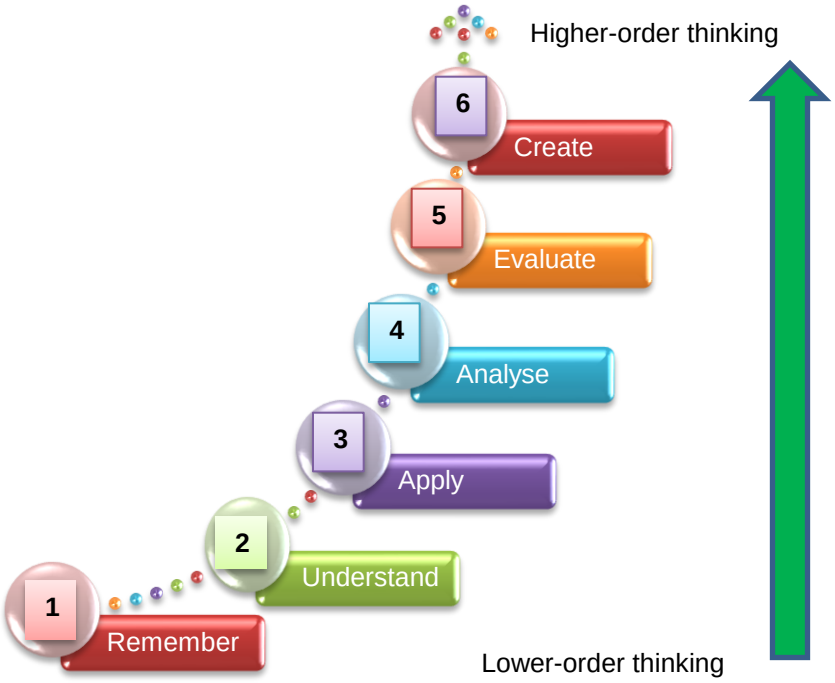
The two models which will form the frame of reference for the current research study are presented below.

2.6.1 Bloom's Taxonomy of higher-order thinking

According to Belgin and Sükran (2011: 180), the APA Delphi study recognized critical thinking skills and higher-order thinking skills as synonymous. Yuretich (2004:40), as cited by BoarerPitchford (2010: 20), concurred that critical thinking involves the demonstration of skills related to higher-order thinking. The concept of higher-order thinking skills was revealed by Bloom's Taxonomy of the cognitive domain. Marquis (2013), concurred that the cognitive skills required for critical thinking mirrored the higher-order thinking levels in Bloom's Taxonomy. Bloom's taxonomy was created in 1956 with the objective of promoting higher-order thinking skills in education, i.e., analysis and evaluation, as opposed to lower-order thinking skills, i.e., memorization of information (rote learning). Krathwohl revised Bloom's original taxonomy in 2001 to

enhance its practical application (Krathwohl 2002: 212). The levels of the revised taxonomy are depicted in Figure 2.3

Figure 2.3 Revision of Bloom's Taxonomy (elements of the cognitive process)



Source: Adapted from Krathwohl (2002: 215)

The levels in the taxonomy are sequential, i.e., one level must be mastered before moving onto the next level. The lower-order thinking skill of remembering or recall of information is a prerequisite for the higher-order thinking skills (Thompson 2011: 3). Students cannot be expected to understand, apply, analyze, evaluate or create knowledge without a theoretical basis. Paul (1992: 16) emphasized that learning is raised through critical thought as individuals move from lower-order thinking to higher-order thinking.

The revised taxonomy is based on the dual goal of education, i.e., to promote the retention as well as the transfer of knowledge (Mayer 2002:226). According to Mayer

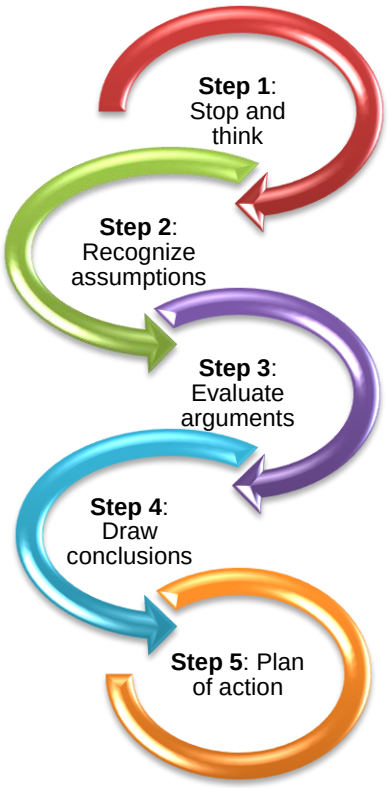
and Wittrock (1996), as cited by Mayer (2002: 226), retention is the ability to remember information at a later stage, while transfer is the ability to apply what has been learnt to solve problems in a new or novel context. Of the six levels identified in the revised taxonomy depicted in Figure 2.3, level one, i.e., remembering, is associated with the retention of information, while the subsequent levels of understanding, applying, analyzing, evaluating and creating are associated with the transfer of information (Mayer 2002: 228).

Black and Ellis (2010), as cited by Thomas (2011: 28), stated that students must be compelled to work at all levels of the taxonomy. When designing assessments, educators must ensure that their assessments blend both lower- order and higher- order thinking skills, which will encourage students to work at all levels of the taxonomy. This can be achieved by the alignment of assessments with the stated objectives as well as the instructional activities (Airasian and Miranda 2002: 249). Tsui (2002), as cited by Behar-Horenstein and Niu (2011: 25), stated that higher-order thinking skills/critical thinking skills can assist individuals to function in different contexts. This assistance provides students with the adaptability required in the work environment.

2.6.2 Watson Glaser RED model of critical thinking

The W-GCTA UK edition is based on the RED model of critical thinking (*Watson-Glaser critical thinking appraisal user guide and technical manual* 2012: 6). This model reflects the three keys areas of critical thinking, i.e., the recognizing of assumptions; evaluation of arguments and drawing of conclusions. These three key areas match the higher-order thinking skills reflected in Bloom's revised taxonomy. The original RED model was adapted by Welsh in July of 2014 to include two additional steps, i.e., stop and think to start off the critical thinking process and plan of action, to end off the critical thinking process. The five step process of critical thinking is depicted in Figure 2.4.

Figure 2.4 RED Model of critical thinking



Source : Adapted from *Watson-Glaser critical thinking appraisal user guide and technical manual* 2012: 6)

The five categories of the W-GCTA are reflected in the RED model. Step 4: Drawing conclusions incorporates inferences, interpretation and deduction. The revised model consists of five steps which are detailed below:-

1. Stop and Think

Do not rush the thinking process. Do not arrive at a conclusion without evaluating all the evidence at hand (Fisher 2011: 5). This is in line with the metacognition requirement mentioned earlier by the experts in the field “thinking about one’s thinking”.

2. Recognize assumptions

This is the ability to make a distinction between fact and opinion based on the evidence provided. Evaluate the information provided by examining the evidence to support it.

3. Evaluate arguments

This is the ability to examine assertions accurately and meticulously. Do not think with your emotions, as emotional thinkers are not critical thinkers. Emotions cloud one's objectivity and lead to poor decision making. (*Watson-Glaser critical thinking appraisal user guide and technical manual* 2012: 7).

4. Draw conclusions

This is the ability to formulate a conclusion, from the evidence provided. The decision could change if the evidence provided changes.

5. Plan of action

This is the ability to construct a plan, i.e., determining the resources required to implement the plan as well addressing the possible consequences of the plan.

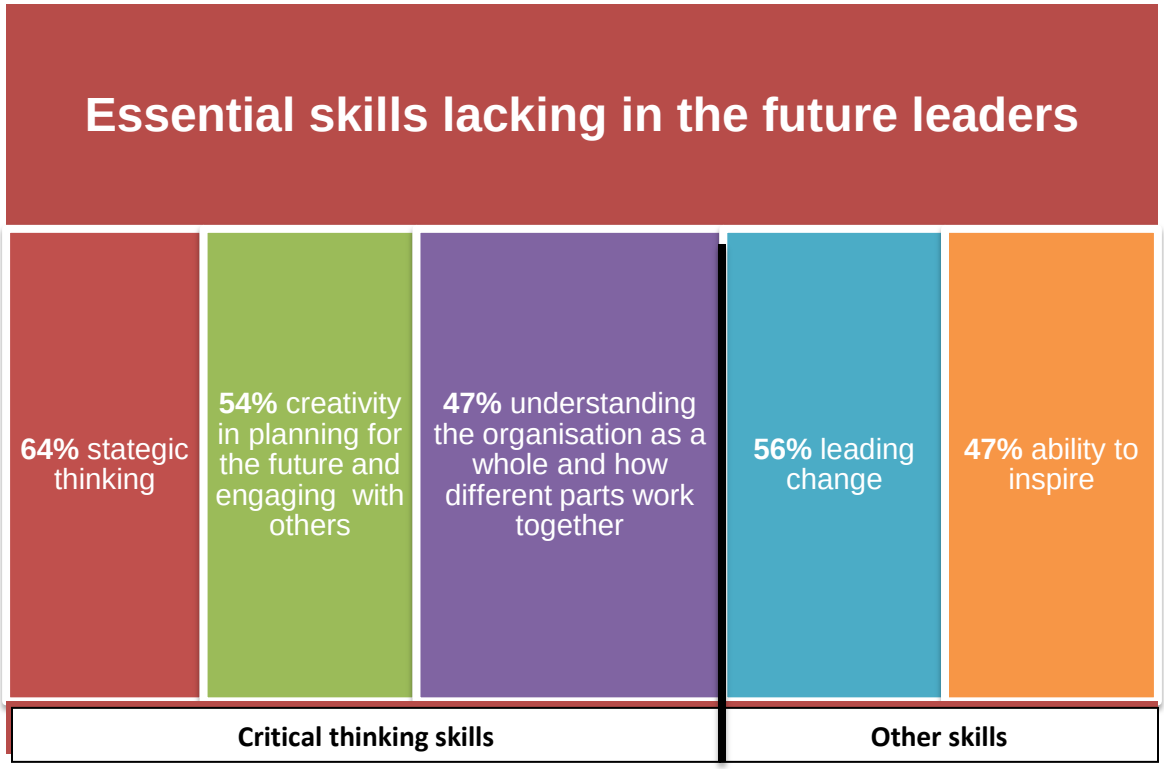
When educators structure assessments, they must ensure that students are conscious of each of the steps in the critical thinking process. The integrated assessment designed for the ECP students required students to work at all levels of Bloom's revised taxonomy. It consisted of five individual assessments. These assessments were interconnected and the students were required to complete the assessments in a specific order. This required the scaffolding of information learnt from one assessment to the next. The fourth assessment required students to draft a business plan for their chosen small business and provide recommendations to the business on how to improve their profitability. The structure of the integrated assessment will be covered in more detail in chapter 4.

2.7 Critical thinking in the work environment

According to Meyer (2007: 1-2), the World Competitiveness Reports revealed that the South African economy cannot compete in the global marketplace due to the lack of human capital development. Higher education has an important role to play in the development of human capital, which, in turn, contributes to economic growth and societal advancement. According to the Joint Initiative for Priority Skills Acquisition (JIPSA), higher education in South Africa is expected to contribute to the skills required by the economy (Griesel and Parker 2009: 2). These expectations are, however, far from being reached, as graduates are ill prepared for the world of work. According to Mlambo Ngcuka, the former deputy president of South Africa, as cited by Griesel and Parker (2009: 2), unemployed graduates, who lack the ability to create self-employment after spending three or four years at a tertiary institution, are evidence of the gap that exists with higher education being unable to equip students with the skills and competencies required in the work place. This gap has been reiterated by numerous other empirical studies which have highlighted the inability of graduates to cope with the workplace requirements (McPhun 2010: 1; Jansen 2012: 1).

There are numerous skills and competencies that graduates require for the work of work, but critical thinking is the most valuable skill that can be imparted to graduates (Thompson 2011: 1). Similarly, Gueldenzoph and Snyder (2008), as cited by BoarerPitchford (2010: 4), stated that graduates must be able to think critically, in order to be effective in the work place. According to the survey done by the Society for Human Resource Management, critical thinking is the skill that has increased in importance over the years (Peason Education 2014: 4). Figure 2.5 illustrates the essential skills that are lacking in the future generation of leaders.

Figure 2.5 Skills lacking in the future leaders



Source: Adapted from Peason Education (2014: 4)

According to Hart Research Associates (2010), as cited by Barnett and Francis (2012: 201), employers acknowledge the importance of critical thinking skills. Thompson (2011: 1) concurred that critical thinking is an important skill for problem solving and innovation. Macpherson (2005), as cited by Macpherson and Owen (2010: 46), also stated that the development of critical thinking skills is important to reinforce decision making.

Due to globalization and the increased momentum of business, organizations require their employees at all levels to be critical thinkers who can make good decisions. Poor decision making impacts directly on the organization's profitability and long-term sustainability. Peason Education (2014: 10) provided examples of businesses that have increased their profitability as a result of good decision making as well as businesses

which have closed down as a result of poor decision making. Employers have recognized the need for employees at all levels to be critical thinkers and have, consequently, invested in training programmes to develop their employees' critical thinking skills. Empirical evidence has indicated that critical thinking training programmes can increase the organization's return on investment by seventeen times (Peason Education 2014: 1-2). To assist employers worldwide, Pearson TalentLens has developed a Critical Thinking University, which is an online portal. This portal consists of eighteen interactive courses, based on real-world business settings (Pearson Education 2015: 1).

According to Hart Research Associates (2010), as cited by Barnett and Francis (2012: 201), employers have indicated that higher education should place more emphasis on critical thinking. Despite this fact, higher education is still failing to impart these critical thinking skills to graduates (Bok 2006, as cited by Barnett and Francis 2012: 201). Human error, as a result of poor decision making, is tantamount to loss of lives and possible diability in the medical field (Macpherson and Owen 2010: 46). In the Management Accounting field, poor decision making is tantamount to loss of income and, in extreme cases, business failure. This will impact negatively on the South African economy.

The gap identified by the numerous empirical studies is evidence of the failure of higher education to inculcate critical thinking skills in its graduates. According to Macpherson and Owen (2010: 46), the argumentation of critical thinking is of paramount importance as it reinforces good decision making which is essential for sound "professional practice".

2.8 Critical thinking within the higher education context

Critical thinking is linked to the constructivist approach of teaching and learning (Thompson 2011: 4). Constructivism, which supports lifelong learning, learner-centredness, participative teaching and problem-based learning, has become an integral part of the South African higher education system. The South African Qualification Authority has reinforced these constructivist concepts by means of the Critical Cross Field Outcomes. Critical thinking is listed as the first Critical Cross Field Outcome, which the National Standards Body requires to be embedded within all qualifications (South African Qualifications Authority 2006: 2).

Despite the constructivist approach being emphasised at institutions of higher learning, the teacher-centred/ traditional approach, which stiffles critical thinking, still dominates classroom and assessments practices (Lombard, K and Grosser 2008: 572-573). This is due to the following reasons:

- Educators need to be critical thinkers themselves in order to infuse these skills in their students;
- Educators are also uncertain about how to teach and evaluate thinking skills (Lombard, K and Grosser 2008: 573) ; and
- Educators have become slaves to the subsidy devil (Jansen 2011), where emphasis is placed on improving pass rates and throughtput rates, above all else, in order to obtain the government subsidy. It is easier to obtain high pass rates with the teacher-centred approach, since this approach encourages students to memorise information for tests and examinations with very little practical implications.

Paul (1992: 4) concurred with teacher-centredness, stating that educators teach a set of tasks in a routine way, and when students replicate what has been taught in a test or examination, educators commend each other on a job well done.

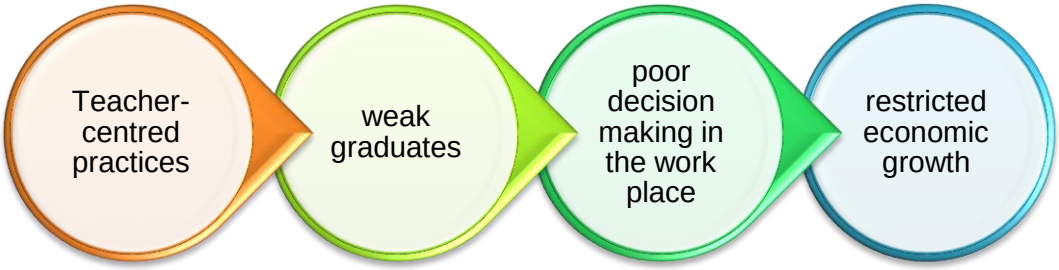
This has resulted in a vicious cycle being perpetuated. The teacher-centred approach, which results in improved pass rates and throughput rates, increases the subsidy that

institutions of higher learning receive from the government. This is a short-term solution, since the consequence of the teacher-centred approach is weak graduates who have not been exposed to critical thinking and, therefore, make poor decisions in the work environment. Poor decision making in the business environment can restrict economic growth. This raises the question of how long will the South African economy survive with poor decision making? The short-term and long-term implications of the teacher-centred approach are illustrated in Figure 2.6 and Figure 2.7, respectively.

Figure 2.6 The short-term implication of the teacher-centred approach

Source: Self-generated

Figure 2.7 The long-term implication of the teacher-centred approach



Source: Self-generated

The long-term solution is the development of critical thinking skills in students. These essential skills will ensure that graduates make a productive and continued contribution to society, their professions and their work environment (Coetzee 2014: 1). Students are required to demonstrate critical thinking skills during their course of study as well as after graduation, but, according to Castle (2009:71), as cited by Pieterse (2012: 2), these required skills are not effectively defined, taught or assessed. Bateinen and Zghoul (2006:37), as cited by Lombard, K and Grosser (2008: 576), maintained that critical thinking skills can be developed through teaching and practice.

Thompson (2011: 1) stated that teaching critical thinking competencies requires a fundamental shift in the following areas:

- from swotting to thinking;
- from repetition and practice to problem solving ;
- from subject separation to subject integration ; and
- from suitability to what is required.

Since assessments reinforce the teaching and learning process, the focus of assessments must also shift to align with instruction. Assessments should require students to solve problems by drawing on their knowledge acquired from the various subject areas that they have been taught.

Numerous empirical studies have indicated that assessment is the “vehicle for change” in higher education (Boud and Falchikov 2006: 400; Boud and Associates 2010: 1; Osborne, Dunne and Farrand 2013: 2). Wilson (2012), as cited by Osborne, Dunne and Farrand (2013: 1-2), stated that assessment is the key that will enhance students’ employability and close the gap between higher education and the workplace requirements. However, the traditional assessment methods, i.e., tests, examinations and academic essay writing are not well matched in preparing students for the world of work. This is due to the fact that students would not be required to perform these tasks in the work environment. Boud and Falchikov (2006: 400) concurred that existing

assessment practices in higher education are not preparing students for lifelong learning.

According to Osborne, Dunne and Farrand (2013: 2), “authentic assessments” are better matched to instilling employability in students, since they focus on problems or tasks that graduates will encounter in the work place. Similarly, Thompson (2011: 5), concurred that assessments which mirror real life situations are particularly useful in the development of critical thinking skills. It is the intention of the current research study to promote the development of students’ critical thinking skills, through the use of integrated assessments, which mirror real life situations. It is evident from the literature reviewed that critical thinking skills are essential skills which will enable graduates to solve problems and make good decisions in the work environment. Authentic and integrated assessments will be explored in chapter 3.

The focus of the current study is on measuring the development of the critical thinking skills of first-year ECP students using the W-GCTA. Although numerous empirical studies have been conducted with regards to critical thinking, the national and international studies that have used of the W-GCTA, to measure the gains in the critical thinking skills of first-year students at tertiary institutions, will be discussed.

2.9 International studies on critical thinking using the Watson-Glaser Critical Thinking Appraisal

Macpherson and Owen (2005)

Macpherson and Owen conducted a study in 2005 at the University of Canberra in Australia. The aim of the study was to determine if there was a change in students’ critical thinking skills after being exposed to a variety of teaching styles which included problem-based learning (Macpherson and Owen 2010: 45).

The study consisted of 79 first-year medical students and used a test-retest design. The W-GCTA form A was administered in February (during orientation) and the W-GCTA form B was administered in October (prior to the final exams). The W-GCTA forms A and B, also comprise of 80 multiple choice questions, but were developed in the United States of America (*Watson-Glaser critical thinking appraisal user guide and technical manual* 2012: 12-13). The current research study used the W-GCTA UK edition, which is also known as form C.

The results of the W-GCTA revealed that there were no significant gains in the students' critical thinking skills, which remained consistent over the one-year period. The older students performed significantly better on form A than their younger counterparts. This continued in form B, but the difference between the older and younger groups was not significant in form B (Macpherson and Owen 2010: 45,54). This study is relevant to the current study since it reinforces the view that critical thinking can be acquired over time, with the necessary practice. It is, therefore, vital that these important skills are taught and assessed from the first year.

The major limitation of the study was the lack of an intervention to measure the development of students' critical thinking skills over time. This limitation will be addressed by the current study in the form of an integrated assessment, which will be administered to a control and experimental group using a pre-test and post-test design.

Barnett and Francis (2008)

Barnett and Francis conducted a study in 2008 at the Northwest Missouri State University in the USA. The aim of their study was to ascertain whether students' test performance and critical thinking skills were related to:

- the infusion and immersion approach to teaching, i.e., combining critical thinking skills with the subject content in the teaching process;
- the use of assessments that contained higher-order thinking questions; and

- grading of assessments based on the level of effort demonstrated by the student (Barnett and Francis 2012: 201).

The study used a classroom-based, quasi-experimental, pre-test, post-test design. It comprised of 147 first-year Educational Psychology students subdivided into the following three experimental groups according to the type of assessment being administered:

Group A: Factual multiple choice questions;
Group B: Higher-order thinking questions; and
Group C: Factual essay questions.

The same instructor taught all three groups ensuring that students were exposed to a consistent teaching style and classroom administration method. The W-GCTA (short form) was administered to all three groups in the first week of the semester and again in the last week of the semester (Barnett and Francis 2012: 204-205).

The results of the W-GCTA revealed no significant difference in the critical thinking gains between the three groups. There was, however, an increase in all the groups' critical thinking skills over the semester period. A significant finding was that group B, i.e., the students who were exposed to the higher-order thinking question, performed better in the class tests than the other two groups who were not exposed to higher-order thinking questions (Barnett and Francis 2012: 206-208).

This study is relevant to the current study since it highlights the importance of assessments that make use of higher-order thinking questions in improving student performance. This approach to assessment design will ensure that students' learning is transformed from rote learning of factual information to a deep understanding of the

material in order to answer the higher-order thinking questions (Barnett and Francis 2012: 209). This is beneficial for subsequent levels of study as well as the world of work. Future research studies must not only focus on the teaching of critical thinking skills, but also on the assessments of these skills. This will ensure that higher education institutions produce competent graduates, who can contribute to their professions as well as society at large.

The limitation of the study was the lack of a control group. This gap is filled by the current study which used both a control group as well an experimental group. Only the experimental group was exposed to the intervention in the form of an integrated assessment. The length of time between the pre-test and post-test also proved to be a limitation, with only a 10-week period between the two tests. According to Behar-Horenstein and Niu (2011: 38), it is easier to ascertain changes in critical thinking with longer treatments/interventions. The current study addresses this limitation with a five-month gap between the pre-test and post-test.

It is noteworthy that the studies of Macpherson and Owen and Barnett and Francis mirrored the current study, as these studies measured the gains in the critical thinking skills of first-year students in a test-retest design. Consequently, the results of the current study will be compared to these aforementioned studies, in chapter 5.

2.10 National studies on critical thinking using the Watson-Glaser Critical Thinking Appraisal – UK edition

According to Pieterse (2012: 15), very few studies on critical thinking have been conducted in SA, particularly studies that have used the W-GCTA to measure undergraduates' critical thinking skills. The current study focused on first-year ECP students for whom the integrated assessment was designed. According to Thomas

(2011: 26), it is important to develop critical thinking skills from first-year level to ensure that students can cope with subsequent levels of study as well as the work environment.

Two national studies on critical thinking were conducted in 2004 and 2008. The first study was conducted by Lombard and Grosser and used the Cornell Critical Thinking Test–level Z (CCTT) to measure the critical thinking abilities of first-year teacher education students. The study revealed a deficiency in the students critical thinking skills and recommended a change in classroom practices (Lombard and Grosser 2004: 215). The second study conducted by Lombard used the W-GCTA and the Cornell Critical Thinking Test–level Z (CCTT) to measure the critical thinking abilities of two cohorts of first-year teacher education students. This study also revealed the inability of these students to think critically and recommended learner-orientated assessments, as a strategy, for enhancing students' critical thinking skills (Lombard, BJJ 2008: 1033,1041).

The second study conducted by Lombard and Grosser also used the W-GCTA, to measure the critical thinking skills of first-year education students. This study also revealed a deficiency in the critical thinking skills of these students. It recommended that educators be guided in the appropriate teaching approaches and assessment practices that will enhance critical thinking (Lombard, K and Grosser 2008: 575).

The major limitation of both these studies was the lack of an intervention to measure the change in the students' critical thinking skills over a period of time. Students' critical thinking skills were only measured at one point in time, i.e., the start of the academic year.

2.11 Conclusion

This chapter covered an in-depth analysis of the dependent variable, i.e., critical thinking on which the study was based. It discussed the background, definition and skills underlying critical thinking. It analyzed the various models which underpinned the theoretical and conceptual framework of the study. It focused on critical thinking in the

work environment as well as the higher education context and, lastly, it reviewed various international and national studies that have made use of the W-GCTA as a critical thinking measure. In addition, objective 1.6.1: to explore critical thinking skills within the higher education context; was addressed by the literature reviewed in the current chapter.

The next chapter will examine the independent variable of the study, i.e., integrated assessments. It will focus on integrated assessments within the higher education context and identify the relationship between integrated assessments and critical thinking.

CHAPTER 3: THE RELATIONSHIP BETWEEN INTEGRATED ASSESSMENTS AND CRITICAL THINKING

3.1 Introduction

The previous chapter covered an in-depth analysis of the dependent variable, i.e., critical thinking upon which the study was based. The current chapter will examine the independent variable of the study, i.e., integrated assessments. It will focus on integrated assessments within the higher education context and identify the relationship between integrated assessments and critical thinking. Hence, it will address objective 1.6.2: to explore critical thinking skills within the higher education context; and objective 1.6.3: to identify the relationship between integrated assessments and critical thinking.

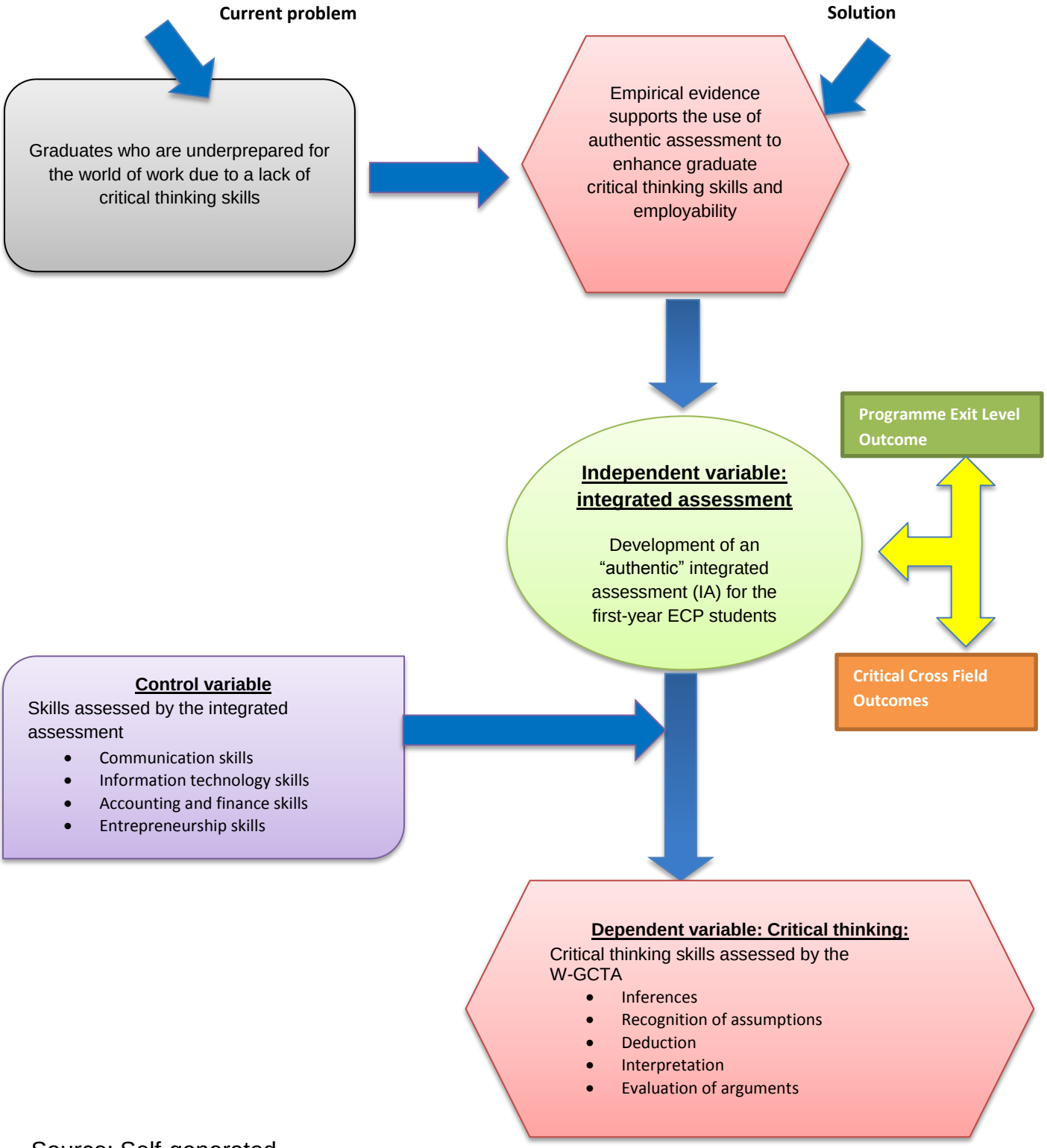
3.2 Overview of the theoretical framework of the current study

According to Sekaran and Bougie (2013: 68), the theoretical framework incorporates a model and a theory. The model is the belief that there is an association between two or more variables while the theory is the explanation that affirms this belief. Furthermore, the authors explained that empirical evidence provides the basis for the model and the theory. The researcher believes that there is an association between the dependent variable, critical thinking and the independent variable, integrated assessments. The researcher's belief is linked to the findings from various empirical studies which will be presented in the latter part of the current chapter. The hypotheses, mentioned in chapter 1, will be tested in chapter 5 using appropriate statistical analysis in order to assess the validity of the theory proposed (Sekaran and Bougie 2013: 68), i.e., whether the integrated assessment conducted with the Extended Curriculum Programme students has improved the critical thinking competencies of these students.

Consequently, the theoretical framework that underpins the current study is the dependent variable (critical thinking) and the independent variable (integrated

assessments). Figure 3.1 provides an overview of the theoretical framework of the current study.

Figure 3.1Theoretical framework of the current study



Source: Self-generated

The various models associated with foundational courses in South Africa will be discussed in order to contextualize the Extended Curriculum Programme offered by the Department of Management Accounting at the DUT.

3.3 Background to the Extended Curriculum Programmes in South Africa

According to the Department of Higher Education and Training (2012: 1), the aim of foundation provision is to provide support to students who are underprepared for higher education, due to their educational background. These students are placed on an extended curriculum programme which is aimed at providing them with the "academic foundations" necessary for the successful completion of their studies (Department of Higher Education and Training 2012: 1). Since 2004, the DHET has provided foundation grants, to fund foundational provision at higher education institutions (Department of Higher Education and Training 2012: 4).

The Department of Higher Education and Training defined an extended curriculum programme as "a whole degree or diploma programme in which foundation provision is located" (Department of Higher Education and Training 2012: 4). The minimum length of an Extended Curriculum Programme must be half an academic year and the maximum length should not exceed one academic year (Department of Higher Education and Training 2012: 6). Foundational courses can be based on four models depending upon the educational purpose and the target groups. These models include: a fully foundational course; an extended course; an augmented course and an augmenting course (Department of Higher Education and Training 2012: 8-9).

Model 1: Fully foundational course

In terms of this model, foundation students were required to complete this course before commencing with the regular first-year course. This model is used when foundation students are extremely underprepared and, therefore, require a substantial amount of

foundational teaching before moving on to the regular first-year course (Department of Higher Education and Training 2012: 8).

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Model 2: An extended course

This model combines foundational material with the regular course material; making the duration of the extended course longer than the corresponding regular course. This model is used when students need a significant amount of foundational provision, but can manage with the introduction of first-year content (Department of Higher Education and Training 2012: 8-9).

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Model 3: An augmented course

This model has the same duration and covers the same material as the regular course. It is, however, taught separately and additional contact time is provided for the foundation provision, i.e., foundational and regular course materials are fully integrated. The contact time of an augmented course is double that of the regular course. This model is used when students are able to manage with the introduction of first-year content early in the programme. They, however, still need a significant amount of "foundation scaffolding" (Department of Higher Education and Training 2012: 9).

Model 4: An augmenting course

This model allows the foundation provision of the course to be provided as a separate module. This model is a variation of model 3.

The extended curriculum programme offered by the Department of Management Accounting at the DUT was designed using a combination of the extended and augmented course models. In the Management Accounting discipline, students are able to cope with the introduction of the regular first-year content in the early stages of the programme, provided that appropriate foundational scaffolding and a substantial increase in contact time is provided. Due to the increased contact time, the number of courses taken per year is reduced. This is evident in the course outline, which is

provided in Table 3.1. Such a reduction allows for the delay in the introduction of the more academically challenging courses to the subsequent years of study.

Table 3.1 Structure of the Regular and Extended programme: National Diploma: Cost and Management Accounting

Years of study	Regular programme (3 years minimum)	Extended programme (4 years minimum)
Year 1 Semester 1	Financial Accounting 1 (Module 1) Communication 1 Business information systems 1 (Module 1) Cost Accounting 1 Economic 1 (Module 1)	Accounting Professional Practice ** Quantitative Literacy** Financial Accounting 1 (Module 1)* Communication 1 Business information systems 1 (Module 1)
Year 1 Semester 2	Financial Accounting 1 (Module 2) Business calculations Entrepreneurial skills Commercial Law for Accountants 1 Economics (Module 2)	Financial Accounting 1 (Module 2) * Business calculations Entrepreneurial skills
Year 2 Semester 1	Financial Accounting 2 (Module 1) Cost Accounting 2 (Module 1) Auditing 2 (Module 1) Commercial Law for Accountants 2 (Module 1) Taxation 1	Economics 1 (Module 1)* Financial Accounting 2 (Module 1)* Cost Accounting 1* Taxation 1
Year 2 Semester 2	Financial Accounting 2 (Module 2) Cost Accounting 2 (Module 2) Auditing 2 (Module 2) Commercial Law for Accountants 2 (Module 2) Business Information Systems 1 (Module 2)	Economics 1 (Module 2)* Financial Accounting 2 (Module 2)* Business Information Systems 1 (Module 2) Commercial Law for Accountants 1

Year 3 **Semester 1**	Management Accounting 3 (Module 1) Financial Accounting 3 (Module 1) Organisational Management 3 (Module 1) Taxation 2 (Module 1) Corporate Procedures 2	Cost Accounting 2 (Module 1)* Financial Accounting 3 (Module 1) Commercial Law for Accountants 2 (Module 1) Taxation 2 (Module 1)
Year 3 **Semester 1**	Management Accounting 3 (Module 2) Financial Accounting 3 (Module 2) Organisational Management 3 (Module 2) Taxation 2 (Module 2) Business Statistics 2	Cost Accounting 2 (Module 2)* Financial Accounting 3 (Module 2) Commercial Law for Accountants 2 (Module 2) Taxation 2 (Module 2)
Year 4 **Semester 1**		Management Accounting 3 (Module 1) Organisational Management 3 (Module 1) Auditing 2 (Module 1) Corporate Procedures 2
Year 4 **Semester 2**		Management Accounting 3 (Module 2) Organisational Management 3 (Module 2) Auditing 2 (Module 2) Business Statistics 2

*Modules requiring additional support

** New modules added

Source: (Durban University of Technology. Faculty of Accounting and Informatics . Department of Management Accounting 2012)

From Table 3.1, the following aspects are noteworthy from the comparison of the programme structures:

- The ECP students have a reduced number of modules per semester, when compared to the mainstream students, with the exception of year 1, semester 1. In year 1, semester 1, the ECP students are required to complete two additional modules/subjects, i.e., Quantitative Literacy and Accounting Professional

Practice. These are the foundational modules designed to assist these students in coping with the demands of higher education. Quantitative Literacy focused on improving students' mathematical skills, in order to solve problems in the commerce field as well as their daily lives. The aforementioned module/subject was examinable. Accounting Professional Practice focused on the Higher Education Literacies and Information Literacy. In this module, students were familiarised with the values, attitudes and the ways of thinking and behaving within higher education. The integrated assessment forms part of the year mark requirement of Accounting Professional Practice, which is a continuous assessment module.

- In addition, for the ECP students, the introduction of the content for the major subject, i.e., Cost Accounting 1, is delayed until the second of study.

The ECP students were required to attend all timetabled lectures and write all assessments planned for the regular programme. In addition, they were required to attend separate timetabled lectures for all the modules that had been identified as requiring additional foundational support. This practice would allow learners to experience first-hand the demands of the regular programme as well as interact with the mainstream students.

It is not always possible to send every student out into industry on internships, but, by exposing students to integrated assessments that require them to solve real-world problems, students are able to see the link between theory and practice. Paul (1992: 23) and Halpern (1998: 454) stated that higher order thinking requires a lot of effort. Consequently, students must be provided with appropriate assessments, which allow them to practise these skills over a period of time, in a variety of settings. Thomas (2011: 32) maintained that these skills are complex and must be introduced at first-year level and then reinforced in subsequent years of study. The current study focused on the gains in the critical thinking skills of the first-year ECP students' post-integrated

assessment. In order for these valuable skills to be reinforced and internalized by students, they need to be practised in subsequent years.

3.4 Background to assessments within higher education

Higher education is the final stage of education for the majority of students before they enter the profession and, consequently, has a significant role to play in preparing students for the world of work (Boud and Falchikov 2006: 405). This crucial outcome of higher education has been under scrutiny by government, higher education institutions as well as the general public (Scott, Yeld and Hendry 2007: 1). Despite this enquiry, empirical evidence has highlighted the gap that exists between what a university qualification articulates and what graduates can do in the workplace (Jansen 2012: 1).

As early as 2007, the South African Higher Education Quality Committee commissioned Scott, Yeld and Hendry to undertake research. The aim of the research was to improve the quality of the undergraduate educational experience, which would consequently improve the quality of graduates from South African institutions of higher learning (Scott, Yeld and Hendry 2007: 1). Although teaching, learning and assessment all have a vital role to play in long-term learning, assessment is seen as the decisive point of intervention that can influence long-term learning (Boud and Falchikov 2006: 405). According to Angelo (1995:7), as cited by Heady (2000: 415), by improving assessments, educators will improve the quality of learning. Assessment is, therefore, the key to improve the quality of student learning and to bridge the gap between theory and practice. Before investigating how assessment can improve the quality of learning, it is important to define the concept of assessment.

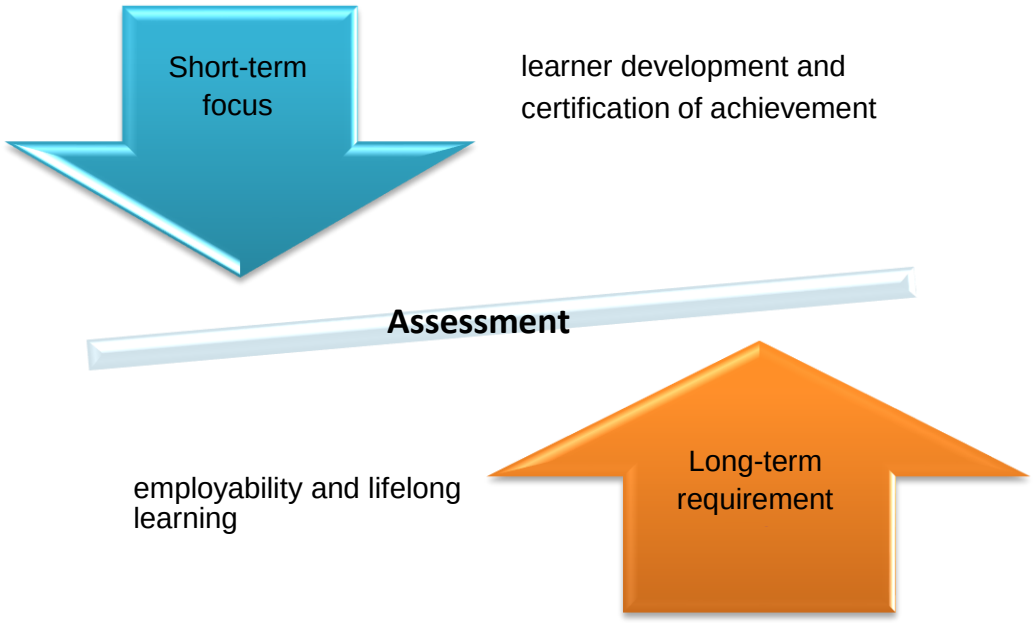
Assessment is a comprehensive term that is encountered in all learning contexts (Büyüköztürk and Gülbahar 2010: 65). The experts have defined assessment as the drawing of conclusions based on whether the students' work meets the applicable

standards (Brown, Bull and Pendlebury 1997: 8; Boud 2000: 151; Boud and Associates 2010: 1). The experts concurred that the purpose of assessment was to measure and improve learning (Barr and Tagg 1995; Banta 1996; Wiggins 1998; Angelo 1999; Biggs 1999, as cited by Heady, 2000: 416). According to Serafini (2000), as cited by Falchikov (2005: 59), there has been a shift in assessment paradigms over the last century, from the teacher-centred/positivist approach to student-centred/ constructivist approach. The aforementioned approaches will be discussed in the latter part of the current chapter.

Since the current study was conducted at the Durban University of Technology, it is allied to one of the aims of the DUT assessment policy, which is to encourage academics to research assessment practices that would enhance the quality of student learning (Durban University of Technology. Centre for Excellence in Learning and Teaching 2014: 3). The current study focuses specifically on integrated assessments as a means of enhancing students' learning, in particular, their critical thinking skills.

The problem of underprepared students for the world of work has been highlighted by empirical evidence provided in the previous chapter. Boud and Falchikov (2006: 399) stated that this under preparedness was as a result of a discrepancy between the short-term focus and the long-term requirement of assessment. According to Boud and Falchikov (2006: 399); and Boud and Associates (2010: 1), the short term focus of assessment is to improve student learning and for certification of achievement, i.e., allowing students to proceed to the next level. The long-term requirement is equipping students to learn beyond the academic context, i.e., employability and lifelong learning (Boud and Falchikov 2006: 399). The short-term focus versus the long-term requirement of assessment is presented in Figure 3.2.

Figure 3.2 The short-term focus versus the long-term requirement of assessment



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Further, Boud and Falchikov (2006: 399-400), stated that assessment practices need to be refocused in order to address the immediate needs of feedback to students and certification, as well as contributing to prospective learning. With the rapid advancements within the global context, it is imperative that institutions of higher learning transform their assessment practices in order to align with both the current and future demands (Boud and Associates 2010: 1).

Assessment dominates the students' higher education experience and effectively supports what they learn and accomplish (Boud and Associates 2010: 1). According to Lombardi (2008: 2), students would not spend more than 10% of their time on work that would not be assessed. Lombardi added that assessment outlines what students view as important, it determines how they utilize their time and how they judge themselves, firstly, as students and, then, as graduates (Brown and Knight 1994, as cited by Lombardi 2008: 2).

Brown, Bull and Pendlebury (1997: 7) maintained that educators can change students' learning by changing their assessment methods. Since assessment has such a huge impact on learning, it is seen as a key element of the teaching, learning and assessment process.

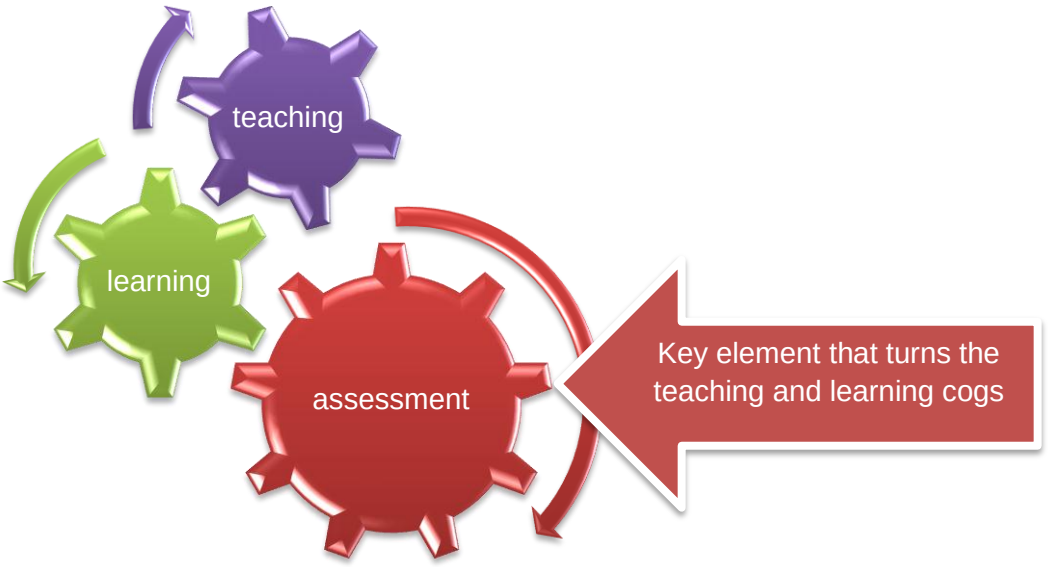
3.5 Interrelated components of the teaching, learning and assessment process

The importance of assessment, as the key element in the teaching and learning process, has been highlighted by numerous empirical studies (Brown, Bull and Pendlebury 1997: 7; Boud and Associates 2010: 1; Wiliam 2011: 3). Assessment is viewed as the key element since it provides a two- pronged feedback:

- to students, on how to improve their learning; and
- to educators, on how to improve their teaching (Brown, Bull and Pendlebury 1997: 11; Heady 2000: 416).

Gijbels, van de Watering and Dochy (2005), as cited by BoarerPitchford (2010: 29), agreed that assessment should not be seen as an add-on at the end of the learning process. Assessment must be integrated with instruction. Biggs (2003), as cited by Boud and Falchikov (2006: 400), viewed the interrelated components of the teaching, learning and assessment process as constructive alignment, i.e., where the teaching methods, assessment tasks and learning activities are carefully aligned to the outcomes of the module. Heady (2000: 419) stated that the teaching, learning and assessment process is cyclical: it begins with teaching and is followed by assessing the results of the teaching process in order to ascertain if learning has taken place. Depending upon the outcome of the assessment, the teaching process will then be revised and the cycle then resumes. The interrelated components of the teaching, learning and assessment process are illustrated in Figure 3.3.

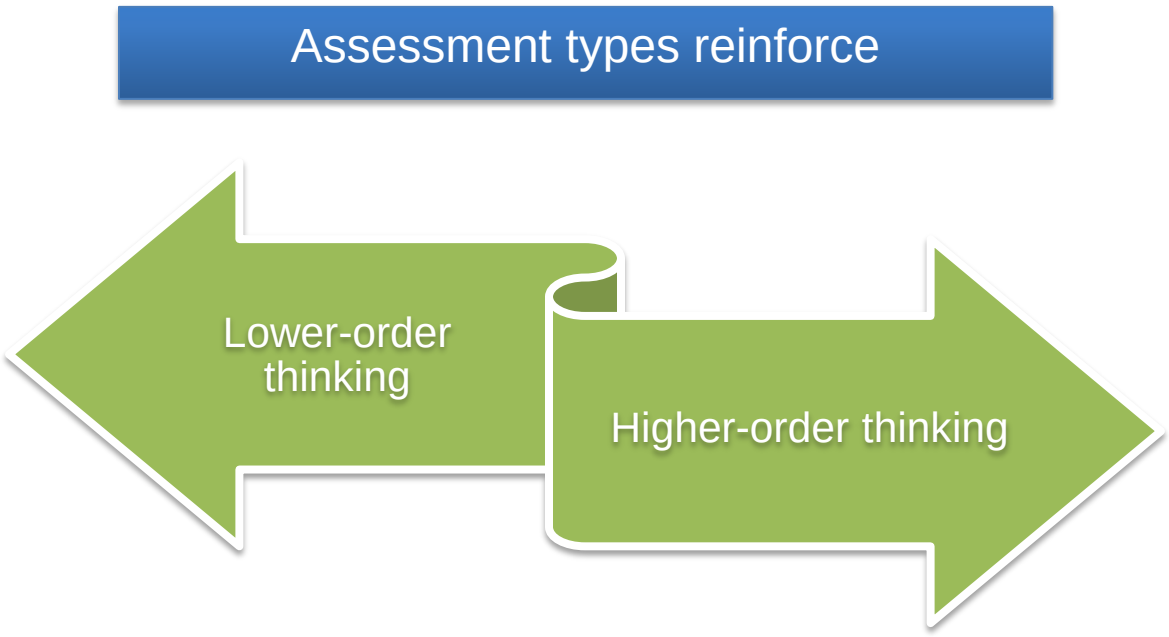
Figure 3.3 The interrelated components of the teaching, learning and assessment process



Source: Self-generated

As a key element, assessment can either constrain or enhance students' learning (Wiliam 2011: 3). According to Biggs (1996), as cited by BoarerPitchford (2010: 28), the type of assessment is the driving force behind the students' studying and learning effort. Students choose to spend their time studying subject content based on how the content will be assessed or evaluated (Lombardi 2008: 1). Boud and Falchikov (2006: 405) termed this the "backwash effect" of assessment. Brown, Bull and Pendlebury (1997: 7-8) and Büyüköztürk and Gülbahar (2010: 55) concurred that appropriate assessment methods impact on how students engage with the content and their level of understanding. Moreover, Büyüköztürk and Gülbahar (2010: 55) stated that this engagement assists students in acquiring higher order thinking skills. According to Gardiner (1998), as cited by BoarerPitchford (2010: 24), active engagement within the learning process is necessary for improved thinking. This is linked to the constructivist approach of teaching and learning which will be discussed in the latter part of the current chapter. The impact of assessment types on students' thinking is illustrated in Figure 3.4.

Figure 3.4 Impact of assessment types on students' thinking



Source: Self-generated

If educators want to develop students' critical thinking skills, they must provide students with appropriate assessments that will enhance these skills. As mentioned in the previous chapter, when designing assessments, educators must blend both lower-order and higher-order thinking skills and compel students to work at all levels of Bloom's taxonomy. Pratt (2002), as cited by BoarerPitchford (2010: 23), stated that questions, which are of a high level, challenge students to move from simple/lower-order thinking to complex/higher-order thinking. According to Nummedal and Halpern (1995), as cited by Barnett and Francis (2012: 202), the acquisition of critical thinking skills/ higher-order thinking skills are not merely a result of instruction. These skills need to be practised through appropriate assessments.

According to Boud and Falchikov (2006: 399) and Beck, Skinner and Schwabrow (2013: 326), higher education must equip students with skills for learning beyond the academic context, when the academic structures with its modules and formal assessments are no longer accessible. A problem highlighted by Boud (2000: 151); and Boud and Falchikov (2006: 400), is that assessment practices at institutions of higher learning were not adequately preparing students for learning beyond the academic context, i.e., employability and lifelong learning.

Over a nine-year period, the Quality Assurance Agency (QAA) for Higher Education reviewed the teaching, learning and assessment practices at universities in England and Northern Ireland. The major weakness in university courses, identified by the QAA was assessment practices (Boud and Falchikov 2006: 402). The following problems associated with assessment practices were identified:

- a limited range of assessments types were being utilised;
- there was an over dependence upon the traditional type of examinations;
- assessments did not challenge students intellectually;
- they did not meet the requirements of the different levels of study; and
- feedback from assessments was lacking and was not given timeously to be of benefit to the student.

The inadequacy of the current assessment types in fostering learning beyond the academy has been highlighted. From the discussion, it is apparent that assessment has a vital role to play in changing the landscape of higher education and moving learning beyond the academy, to the world of work/lifelong learning. The discussion will continue by exploring the different types of assessments, within the higher education context.

3.6 Types of assessments within the higher education context

At higher education institutions, educators use different types of assessments to make judgments about the students' level of achievement. Moreover, these judgments can have a tremendous impact on the students' career path (Büyüköztürk and Gülbahar 2010: 56). The type of assessment used by the educator will impact on the "students' study habits, learning preference, levels of understanding, levels of knowledge, and skills in transforming theory into practice" (Büyüköztürk and Gülbahar 2010: 56). Assessments within the higher education context can be classified into two categories, i.e., traditional/teacher-centred assessments and learner-oriented/student-centred assessments. The discussion will continue by exploring the traditional assessment methods that dominate the higher education context. The inadequacies of these traditional assessment types in fostering critical thinking will be highlighted. Learner-oriented assessments that enhance critical thinking will also be investigated.

3.6.1 Traditional assessments /Teacher-centred assessments

Traditional assessments are an extension of the teacher-centred paradigm, where educators transmit information to passive students, who are then required to recall this information at a later stage (Huba and Freed 2000: 1). Boud and Falchikov (2006: 406) concurred that students are not seen as active agents within the assessment process, which is merely imposed on them by educators. Assessment tasks are often decontextualized and emphasis is placed on correct answers (Huba and Freed 2000: 1). Furthermore, Huba and Freed explained that assessment tasks are not interdisciplinary, but rather focus on a single discipline.

The traditional types of assessment that dominate higher education are formative and summative assessments (Boud and Falchikov 2006: 401). These are seen as traditional assessment methods, not because they are out-of-date, but rather from the perspective that they are used most frequently, within the higher education context. Since this study

was conducted at the Durban University of Technology, the definitions laid down in the institution's assessment policy were used for the purpose of this research.

3.6.1.1 Formative and Summative assessments

Formative assessment "refers to assessment that is used to support the student developmentally and to feed back into the teaching and learning process. This suggests that there is a relationship between assessment, learning and teaching, and that assessment informs and strengthens both the teaching and learning process" (Durban University of Technology. Centre for Excellence in Learning and Teaching 2014: 6).
Summative assessment "means assessment that makes possible total evaluation of the extent of the student's progress at the end of a module or finite part of the programme. Results of summative assessment may be used to determine whether the student may proceed to the next level of study in a programme" (Durban University of Technology. Centre for Excellence in Learning and Teaching 2014: 7).

Formative and summative assessments are allied with the short-term focus of assessment. According to Boud and Falchikov (2006: 401), formative assessments focus on improving student development, while summative assessments focus on certification, as highlighted earlier in the chapter in Figure 3.2. Educators at institutions of higher learning use assessment primarily to provide students with course marks (Banta 2002, as cited by BoarerPitchford 2010: 26-27). This can impact negatively on student learning, since students will be motivated to only study the content that they know will be tested in order to obtain good course marks (Crooks 1988, as cited by BoarerPitchford 2010: 27). Numerous empirical studies have highlighted the negative impact that formative and summative assessments can have on student learning (Ecclestone 1999; Knight 2002; Knight and Yorke 2003, as cited by Boud and Falchikov 2006). How educators perceive and implement formative and summative assessments can be counterproductive to the achievement of the long-term requirements of assessment (Boud and Falchikov 2006: 401,403).

As mentioned in chapter 2, the constructivist approach, which supports lifelong learning, through learner-oriented teaching and assessment practices, has become an integral part of the South African higher education system. The DUT assessment policy has been aligned to this constructivist approach, since it views student-centredness as the key pillar that informs all teaching, learning and assessment practices at the university (Durban University of Technology. Centre for Excellence in Learning and Teaching 2014: 2). As mentioned previously, although the constructivist approach has been emphasized, teacher-centred approaches, which restrict critical thinking, still dominate teaching and assessment practices at institutions of higher learning (Lombard, K and Grosser 2008: 573). Educators preferred the traditional assessment methods due to large classes and time constraints resulting from research and other administrative requirements (Lombard, BJJ 2008: 1039; Lombard, K and Grosser 2008: 573; Lombardi 2008: 2,4). In addition, educators may be reluctant to change their assessment methods since changing assessment practices can be more challenging than the actual assessment activity (Brown, Bull and Pendlebury 1997: 222). McPhun (2010: 3) avowed that educators cling to the traditional assessment methods because they are not willing to move out of their "comfort zones". The researcher concurs with this belief as the development of the integrated assessment for the first-year ECP students proved to be an extremely labour-intensive process, requiring weekly meetings over a nine-month period.

From the discussion, it is evident that formative and summative assessments both have their merits. However, if educators design these assessment types, comprising of only lower-order questions, students' critical thinking skills are inhibited. Consequently, educators need to change their perception of assessment. Assessment must not be viewed as merely a tool to provide students with marks, but also as a means of instilling work-readiness skills within students.

3.6.1.2 Model for traditional assessments

McPhun (2010: 2) illustrated a model, Figure 3.5, which was used in the design of traditional assessments.

Figure 3.5 Traditional assessment design sequence

Source: McPhun (2010: 2)

The model in Figure 3.5 illustrates that both instruction and assessment are aligned to a specific topic. The two main shortcomings of this model are the emphasis on content coverage and the fragmentation of knowledge.

Emphasis on content coverage

According to Allen (2004: 1), the covering of the course content was highlighted as the goal for teaching under the teacher-centred paradigm. Lombard, BJJ (2008: 1038) concurred that the teacher-centred approach emphasized content coverage as opposed to student engagement. Empirical evidence indicated that covering a large amount of

content will hinder students' understanding and result in them achieving low marks in assessments (Lombardi 2008: 4). According to Paul (1992: 4), covering too much content perpetuates lower-order thinking which is associated with rote memorization. The consequence of lower-order thinking is that students will exit university with ″a jumble of undigested fragments left over after they have forgotten most of what they had to cram into their short-term memory for particular tests ″ (Paul 1992: 7). At institutions of higher learning, students are bombarded with large volumes of content that must be covered in time-constrained modules. Students, consequently, revert to rote learning, since there is insufficient time for them to acquire a deep understanding of the topic. Bezuidenhout and Alt (2011: 1075) concurred that the covering of content by rote learning encourages lower-order thinking.

Paul (1992: 5-6) maintained that the recollection of information is not the same as knowledge. Further, he stated that students will only gain knowledge through critical thought. Similarly, Bezuidenhout and Alt (2011: 1063), stated that students need to convert the content acquired into knowledge for themselves. This requires students to actively engage with the content. From the perspective of the current study, which focuses on first-year ECP students within the Management Accounting Department at the DUT, the objective is to train these students to not merely recall various costing techniques, but to think like management accounting practitioners. In order to achieve this objective, the integrated assessment, which was designed for these students, was aligned to the exit level outcome of the programme. The exit level outcome of the National Diploma: Cost and Management Accounting is that graduates should be capable of practising as accountants and rendering accounting services to commerce, industry and the public sector.

The researcher believes that the model, depicted in Figure 3.5, emphasizes the covering of content, since there are numerous topics that educators would be required to teach and assess by the end of a module.

Fragmentation of knowledge

According to Boud and Falchikov (2006: 402); and Lombardi (2008: 2), formative assessments promote learning in a silo, where students only learn specific content that they know is going to be assessed. Paul termed this type of learning as “fragmentary learning”. The implication of this kind of learning is that students do not have a holistic view of knowledge and learning. Therefore such learning becomes transient (Paul 1992: 6).

Boud and Falchikov (2006: 410), maintained that there needs to be a holistic approach to assessment, in order to promote the development of skills required for lifelong learning. Thomas (2011: 26) maintained that critical thinking is an essential skill that must be fostered within students while at university. Moreover, these authors maintained that assessment tasks in one module of study must be complementary to the assessment tasks in other modules of study, within a progamme. This holistic view of assessment is addressed by the current study since the integrated assessment, which was designed for the first-year ECP students, required students to utilize their knowledge acquired from various modules covered in their first-year of study. This made the links between the various subjects/modules evident. The structure and requirements of the integrated assessment will be discussed in chapter 4.

From the above discussion, it is evident that the model in Figure 3.5 could result in the fragmentation of knowledge. It does not promote a holistic view of knowledge since the focal area in the designing of instruction and assessment tasks is solely the unit standard or topic.

According to Lombardi (2008: 3), traditional methods can defer the development of independent thinking. These traditional methods will be explored further.

3.6.1.3 Traditional assessments and critical thinking

Students ascertain whether surface learning or in-depth understanding is required based on the assessment type used by the educator (Struyven, Dochy, Jansses, Schelfhout, and Gielen 2006, as cited by BoarerPitchford 2010: 28). Ramsden (1988), as cited by Brown, Bull and Pendlebury (1997: 7), concurred that, if students are required to merely reproduce what has been learnt, this would result in them refusing to explore a deeper approach to learning since an in-depth understanding of the content is not required by the assessment. According to Watkins and Hattie (1985), as cited by Brown, Bull and Pendlebury (1997: 7), the use of tests that require students to reproduce material learnt inhibit in-depth understanding, while the use of projects and open-ended assessments promote in-depth understanding of the material learnt. Terenzini, Springer, Pascarella and Nora (1990), as cited by BoarerPitchford (2010: 5), stated that factual information has a short lifespan with students. When educators emphasize the recollection of factual information, students will be intellectually constrained (Paul 2004, as cited by BoarerPitchford 2010: 5).

Traditional assessments provide educators with information pertaining to students' short-term memory, but do not provide information about students' thinking skills (Wiggins 1989, as cited by BoarerPitchford 2010: 2). Ennis (1993), as cited by BoarerPitchford (2010: 4), suggested that, in order to promote critical thinking, educators should use assessment methods that require students to think and not merely recall information.

The recall of information is the scaffolding required for critical thinking. Students need to be competent in lower-order thinking skills before moving on to higher-order thinking skills (Lemov 2010, as cited by Thompson 2011: 3). This is in line with Bloom's Taxonomy of higher-order thinking, mentioned in the previous chapter, where students are required to master the lower levels of the taxonomy, before moving on to the higher levels of the taxonomy. Furthermore, Thompson maintained that, to foster critical thinking, educators must not only provide students which assessments that require the

recall of information. Students should also be required to interpret, analyse, evaluate or synthesize information. These are essential components of critical thinking. Boud and Falchikov (2006: 410) maintained that it would be necessary to provide students with scaffolding to ensure that they can move from their current level of knowledge to that which is required for the solving of more complex problems.

Examinations are beneficial, but educators should not utilize them as the predominant assessment method (Dochy and McDowell 1997, as cited by BoarerPitchford 2010: 31). The current study utilizes the benefit of the traditional assessment method, i.e., the memorization of information. The integrated assessment that was designed for the first-year ECP students required students to apply knowledge learnt to solve a real-world problem. The integrated assessment comprised of five assessments, and culminated in a business plan being drafted for an existing small business. The assessments had to be completed in a specific order, to scaffold students' understanding. Detailed rubrics were provided for each assessment which made the transition from lower-order thinking to higher-order thinking possible. Rubrics are an important element of assessment since they make the criteria/requirements of the assessment explicit to students (Heady 2000: 419). The requirements of each of the five assessments will be covered in detail in chapter 4.

Brown, Bull and Pendlebury (1997: 7) affirmed that educators can transform students' learning by changing their assessment methods. When transforming assessment practices, educators must be aware of what students would be required to do post-graduation, in order for such a transformation to be beneficial to students in the long-term. Lombardi (2008: 2) affirmed that students spent 90% of their time at university on written examinations. Further, Lombardi questioned whether the students that obtained high marks on these written exams were ready to apply this knowledge in a creative way (Race and Brown 2001, as cited by Lombardi 2008: 2). Consequently, it was recognized that alternative assessment types were needed in order for educators to make judgments concerning students' creativity and decision making on tasks encountered in the real-world (Lombardi 2008: 2).

According to Buhagiar (2007), as cited by BoarerPitchford (2010: 27), the assessment purpose has shifted from measuring student achievement to a means of promoting higher-order thinking skills. Learner-oriented assessments are more suited to the promotion of higher order thinking skills.

3.6.2 Learner-oriented assessments/ Student-centred assessments

Learner-oriented assessments are an extension of the student-centred paradigm, where students are active participants in the learning process and educators act as facilitators (Huba and Freed 2000: 1). These authors explained that students are required to construct knowledge by integrating information using communication, critical thinking and problem solving skills. Learner-oriented assessments are contextualized and interdisciplinary, i.e., they focus on problems encountered in the real-world, which requires students to use their knowledge from the various disciplines in order to solve the problem (Huba and Freed 2000: 1). The emphasis of the student-centred paradigm is on student engagement.

Paul (1992: 4) noted that, if students are not actively involved in the learning process, their adaptability to the work environment is severely restricted. The active engagement in the learning process is necessary for the development of students' critical thinking skills (Gardiner 1998, as cited by BoarerPitchford 2010: 24). According to Reilly, as cited by Halx and Reybold (2005: 303), boredom hinders the development of critical thinking. It is, therefore, vital that educators keep students engaged at all times. This is linked to the dispositional aspects of critical thinking. In addition, students' assessment preferences can also have an impact on their learning. Büyüköztürk and Gülbahar (2010: 55-56) maintained that students used surface learning when studying for written examinations, as opposed to deeper learning when compiling assessment essays. Further, the authors revealed that students preferred alternate assessment methods which resulted in deeper understanding, i.e., assessment essays, as opposed to written examinations.

The DUT assessment policy, which is based on the philosophy of student-centredness, also promotes the use of various methods of assessments, particularly those types of assessments that encourage critical thinking and problem solving in “discipline-or profession-specific contexts” (Durban University of Technology. Centre for Excellence in Learning and Teaching 2014: 2). According to Lombard, BJJ (2008: 1030,1038), learner-orientated assessments is an approach for enhancing students’ critical thinking skills. Therefore, learner-oriented assessments incorporate or achieve critical thinking, which is not included in the traditional assessment methods.

The use of interdisciplinary, hands-on examples will assist students in developing higher-order thinking skills (Anonymous 2010). Therefore, the main types of learner-oriented assessments that the current study will focus on is authentic assessments, which are linked to hands on real-world problems and integrated assessments which focus on interdisciplinary tasks. The current study focuses on the integrated assessment that is based on a real-world problem.

The discussion will continue by exploring integrated assessments and authentic assessments. The impact that these assessment types have on critical thinking will also be examined.

3.6.2.1 Authentic assessments

The problem with traditional assessments is that they focus on the recall of factual knowledge without having to apply this knowledge to problems encountered in the real-world, i.e., the world of work (Huba and Freed 2000, as cited by BoarerPitchford 2010: 2). Huba and Freed (2000); Palomba and Banta (1999), as cited by BoarerPitchford (2010: 5), concurred that assessments should mirror the problems that students would encounter in the work environment. As mentioned in chapter 2, Osborne, Dunne and

Farrand (2013: 2) stated that authentic assessments are better suited for employability as they focus on problems or tasks that graduates will encounter in the work place.

Wiggins (1993), as cited by BoarerPitchford (2010: 2), defined authentic assessment as "a performance-based evaluation method in which students complete tasks in contextualized situations to provide real life learning experiences". Moreover, Wiggins claimed that authentic assessments evaluate the students' capacity to apply knowledge to new contexts (Wiggins 1998, as cited by BoarerPitchford 2010: 32). According to Lombardi (2008: 6), the key aspects of authentic assessment methods were as follows:

- They were aimed at developing meaningful skills;
- They stimulated divergent thinking, by exposing students to a variety of possible answers;
- They emphasized student competence in real-world tasks;
- They highlighted the importance of collaborative learning; and
- They trained students on how to deal with uncertainties and exceptions that may be encountered in the work environment.

Lombardi (2008: 10) noted that the general assessment tools used to incorporate real-world practice into the students' university experience were: case studies; literature reviews; exploratory projects; simulation and role play. The integrated assessment, which was designed for the first-year ECP students, can be categorized as an exploratory project.

According to Boud and Falchikov (2006: 406), there is a significant difference between learning within an educational setting as opposed to learning in the work environment, and assessment has an important role to play in bridging this gap. According to Halx and Reybold (2005: 303), students must know how the content fits into the real-world. This is the most effective way of promoting critical thinking. Halx and Reybold also

maintained that students cannot learn by merely observing content. Students must see the relationship between the content and the real-world. Merely possessing the factual knowledge is insufficient. Students must be able to use this knowledge to think critically and solve real-world problems (Gueldenzoph and Snyder 2008, as cited by BoarerPitchford 2010: 20).

Educators should, therefore, use assessment methods, such as authentic assessments, that would empower students to think like practitioners and not like students.

3.6.2.2 Authentic assessments and critical thinking

The aim of authentic assessments is to engage students in higher-order thinking while revealing the students' knowledge of a specific topic (Morris 2001, as cited by BoarerPitchford 2010: 32). Empirical evidence affirms that authentic assessment methods promote critical thinking (Wiggins 1989; Lund 1997; Johnson *et al*. 1998; Palomba and Banta 1999; Boud and Falchikov 2006, as cited by BoarerPitchford 2010: 2,4,9).

Johnson *et al* (1998), as cited by BoarerPitchford (2010: 4), concurred that authentic assessments are viewed as superior to traditional assessments in the promotion of critical thinking, since they require students to use their acquired knowledge to solve problems and not merely memorize information that was acquired out of context. Halpern (1998: 454) suggested the frequent use of "authentic materials", similar to those encountered in the work environment, to assist students in the transfer of knowledge to new situations encountered in the work environment.

Thompson (2011: 5) maintained that, to assess critical thinking, educators must use both formal and informal assessment tasks that integrate real-world scenarios, such as

business plans, etc. Further, Thompson stated that, in order to complete such tasks or projects, students would have to gather information, work within the given time frame, collaborate with other students and consider the possible outcomes.

Authentic assessments are linked to the current study since the integrated assessment designed for the first-year ECP students was based on a real-world problem. As mentioned earlier, the integrated assessment comprised of five individual assessments which culminated in the design of a business plan for a chosen small business. Students had to gather information, work collaboratively with their group members; adhere to the time frames laid down in the integrated assessment and consider possible recommendations for improving the profitability of the chosen small business. It is difficult to ascertain whether or not critical thinking skills were modelled or demonstrated to students prior to the integrated assessment, since these skills are not taught directly to students, but rather indirectly within the course content being covered. As mentioned in subsection 2.2 of chapter 2, the study will not focus on the teaching of critical thinking skills, but on how integrated assessments can enhance the critical thinking skills of the ECP students.

It is evident from the literature that students engage in critical thinking when they are required to solve problems within as real-world context (Washburn 2001, as cited by BoarerPitchford 2010: 25).

3.6.2.3 Integrated assessments

Objective 1.6.2: to examine integrated assessments within the higher education context; and objective 1.6.3: to identify the relationship between integrated assessments and critical thinking; will be addressed in the literature that follows.

Empirical evidence indicates that courses or modules offered at university tend to be constructed in isolation and that learning appears to be decontextualized (Boud and Falchikov 2006: 10). Moreover, the authors maintained that the modularization of courses hinders a holistic approach to assessments. Integrated assessments address the shortcoming of the traditional assessment method, i.e., fragmentation of knowledge by providing students with a holistic view of knowledge. According to Ennis (1989), as cited by Behar-Horenstein and Niu (2011: 27), the holistic view of knowledge, which is promoted by integrated assessments, is a quality that critical thinkers possess.

Since the current study was conducted at the Durban University of Technology, the DUT assessment policy forms the frame of reference for the discussion of integrated assessments. The DUT assessment policy asserts that academics as assessors must endeavour to adopt an integrative approach to knowledge that seeks to demonstrate the interconnectedness of knowledge, as reflected in the exit level outcomes of an academic programme (Durban University of Technology. Centre for Excellence in Learning and Teaching 2014: 2).

According to the DUT assessment policy, an integrated assessment refers to "a holistic approach, in that the tasks combine the assessment of a variety of different skills at the same time; and/or assess a number of outcomes together; and/or assess a number of assessment criteria together; and/or use a combination of assessment methods and instruments; and/or acquire evidence from other sources, for example, portfolios, journals, logbooks, supervisor reports" (Durban University of Technology. Centre for Excellence in Learning and Teaching 2014: 6). This policy promotes the use of integrated assessments across different levels and within modules (subjects) or in the capstone module (Durban University of Technology. Centre for Excellence in Learning and Teaching 2014: 3).

In line with the DUT assessment policy, an integrated assessment was designed for the first-year ECP students. The exit level outcomes for the National Diploma: Cost and Management Accounting programme, as well as certain critical cross field outcomes were used as the basis for the development of the integrated assessment. As mentioned earlier in the chapter, the exit level outcome of the National Diploma: Cost and Management Accounting is graduates being capable of practising as accountants and rendering accounting services to commerce, industry and the public sector. The following Critical Cross Field Outcomes, as laid down by the South African Qualifications Authority (2006: 2), formed the basis for the development of the integrated assessment:

- Identify and solve problems in which responses display that responsible decisions using critical and creative thinking have been made;
- Work effectively with others as a member of a team, group, organisation, community;
- Organising and managing activities responsibly and effectively;
- Collect, analyse, organise and critically evaluate information;
- Communicate effectively using visual, mathematical and/or language skills in the modes of oral and/or written persuasion;
- Demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation;
- Reflect on and explore a variety of strategies to learn more effectively; and
- Explore and develop entrepreneurial opportunities.

The objective of this integrated assessment was to improve the critical thinking competencies of the first-year ECP students, by exposing them to a real-world problem, which had to be solved by integrating their knowledge from the various first-year modules, i.e., Accounting Professional Practice, Quantitative Literacy, Financial Accounting 1, Communication 1 and Business Information Systems (module 1). Students were not required to work independently on the integrated assessment, but rather as groups which mirror the dynamics of the work environment (Lombardi 2008:

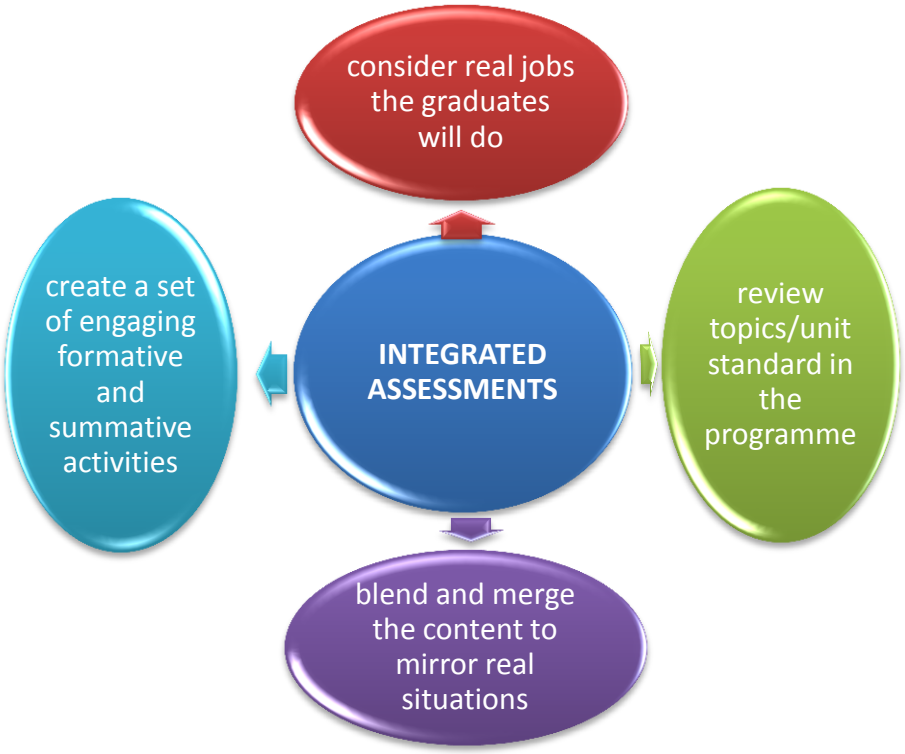
8). As mentioned earlier, the integrated assessment designed for the first-year ECP students consisted of five individual assessments, with detailed rubrics. At each stage of the integrated assessment, the students' performance was reviewed and a resubmission was required if they did not attain the required standard. Constructive feedback was given at each stage of the assessment to ensure that faulty thinking was corrected at an early stage.

From the literature, it is evident that integrated assessments provided students with a holistic view of knowledge which promoted critical thinking. Thomas (2011: 26), stated that it is important to develop critical thinking skills, from the first year. Consequently, integrated assessments should be conducted in the first year and in subsequent years.

3.6.2.4 Model for integrated assessment design

McPhun (2010: 3) designed a model for integrated assessment which, according to the authors, "tips the traditional model on its head". This model is reflected in Figure 3.6.

Figure 3.6 Integrated assessment design sequence



Source: McPhun (2010: 4)

Integrated assessments provide a learning juncture based on what graduates would be expected to do in the work environment. Further, McPhun (2010: 3) stated that integrated assessments pool the learning outcomes and then merge these outcomes into rationalized "employment focused activities" or tasks. This is evident from the four-stage design sequence which is as follows:

Stage 1: Consider the real jobs that graduates will do.

Heady (2000: 417) noted that employers can provide valuable input regarding the suitability of learning objectives. According to McPhun (2010: 3), the major challenge in the development of integrated assessments is to ensure that academics have a thorough understanding of the workplace requirements.

External engagement with employers as well as professional bodies can, therefore, provide vital feedback in ascertaining what graduates are expected to do in the real-world.

Stage 2: *Review topic/unit standard in the programme*

The topics or unit standards within the programme are examined and shared themes/ competencies and related knowledge are identified (McPhun 2010: 3). Further, McPhun stated that it is important to have a good understanding of how the topics relate to the regular order of events within the work environment.

Stage 3: Blend and merge the content to mirror real situations

The shared themes/competencies and related knowledge identified in stage 2 are then combined and aligned to the "real-world graduate requirements", identified in stage 1 (McPhun 2010: 3).

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Stage 4: Create a suite of engaging formative and summative activities

The final step involves the designing of a set of assessment tasks that would appeal to students.

Integrated assessments can make a significant contribution to the transfer of learning from the university domain into the world of work (McPhun 2010: 4). Vanderheide and Walkington (2008: 351) maintained that integrated assessments can enhance the link between theory and practice. If integrated assessments are applied, graduates will be prepared for the realities of the workplace and will certainly hit the ground running (McPhun 2010: 7).

Integrated assessments undoubtedly form an integral link between theory and practice. Consequently, students subjected to integrated assessments at the tertiary level should adapt more efficiently and effectively to the work environment.

3.7 Relationship between integrated assessments and critical thinking

According to Halx and Reybold (2005: 302), interdisciplinary content is required for critical thinking. Thompson (2011: 1) concurred, that, in order to promote critical thinking, educators need to shift their focus from subject isolation to subject integration.

Emphasis must be placed on the development of integrated assessments that mirror real life situations. Paul and Nosich (2013) developed a model for the national assessment of higher order thinking (critical thinking). This model consists of a number of criteria. The following criteria indicate the link between critical thinking and integrated assessments. Assessments should:

- require students to transfer knowledge to a variety of situation;
- address the interconnectedness of knowledge (interdisciplinary integration); and
- address the basic skills required to make decisions in the workplace.

Boud and Associates (2010) recognized the need for assessment practices to be renewed in order to meet the present and future requirements of the workplace. With the assistance of academic development practitioners, senior academic managers and experienced assessment researchers, they developed seven propositions for the transformation of assessment in higher education. The propositions that emphasized the use of integrated assessments in the development of higher order thinking were summarized as follows:-

- assessments must be prepared across subject and programmes with corresponding integrated tasks; and
- integrated assessments, as opposed to numerous stand-alone formative assessments, enhance students' critical thinking skills. These stand–alone formative assessments compartmentalise learning and fail to show students how knowledge is interrelated. Vanderheide and Walkington (2008: 352) agreed that too many stand-alone assessments discourage critical thinking, since students do surface learning in order to cope with the volume of work.

The discussion will continue by exploring an international and national study that used an integrated assessment to improve student learning.

3.8 International study on integrated assessments

Vanderheide and Walkington (2008: 353) conducted an integrated assessment (multidisciplinary project) over a twelve-month period, with nursing students at an Australian university. The objective of the study was twofold, i.e., to enhance the linkage between theory and practice and to address the assessment workload of students and academics.

Benefits of the study for both students and academics (Vanderheide and Walkington 2008: 354) were as follows:

- the majority of students found the project useful. It decreased their assessment workload and improved their learning connections; and
- there was an increased collaboration between academics in the design, implementation and assessment of the project. This resulted in a richer learning experience for the students.

However, the study had the following limitations:

- since the project linked the content of two subjects (modules), some students found the project more stressful. Failure to understand the connections would result in the student failing both modules; and
- this form of assessment was not embraced by all academics.

This international study provides empirical evidence that integrated assessments improve students learning. The current study addresses the limitation of the international study by incorporating the integrated assessment into one subject, i.e., Accounting Professional Practice. Consequently, if students failed the integrated assessment, the failure would only impact on their performance in one subject area on the programme. The unwillingness of academics, who teach on the programme, to

participate in the design of the first-year ECP integrated assessment, was evident. Only four academics were involved in the design of the integrated assessment, i.e., a teaching and learning practitioner for student development from the Centre for Excellence in Learning and Teaching, the subject librarian for the Faculty of Accounting and Informatics and two academics from the Management Accounting Department. As mentioned earlier, the integrated assessment took approximately nine months to develop. This period equates to approximately seventy two hours in total, i.e., two hours a week for nine months.

3.9 National study on integrated assessments

McPhun (2010: 1) developed a model for the design of an integrated assessment that challenged the traditional assessment model. This model was presented earlier in the chapter, in Figure 3.5 and Figure 3.6. McPhun, implemented the integrated assessment approach with a cohort of students in 2004 and 2009.

The study highlighted the following benefits for students, graduates and employers:

- all the students from both cohorts found the assessment design practical and a valuable learning experience;
- 60% of the 2004 cohort were employed in industry, and via a conversational survey indicated that their learning was meaningful and had prepared them for the work environment; and
- their employers also indicated that they were satisfied with the job readiness of these graduates.

A limitation of the national study is that it did not measure the development of critical thinking skills within students, but rather placed emphasis on student and employer perceptions of the integrated assessment. The current study will address this limitation by measuring the students' critical thinking skills pre- and post- integrated assessment, to ascertain if there have been any gains in students' critical thinking skills after the completion of the integrated assessment.

3.10 Conclusion

The current chapter examined the independent variable of the study, i.e., integrated assessments. It also focused on integrated assessments within the higher education context and identified the relationship between integrated assessments and critical thinking. Consequently, objective 1.6.2: to examine integrated assessments within the higher education context; and objective 1.6.3: to identify the relationship between integrated assessments and critical thinking; were addressed by the literature explored in the current chapter.

This next chapter will discuss the research methodology, i.e., the research design, data collection and analysis and delimitations of the study.

CHAPTER 4: RESEARCH METHODOLOGY

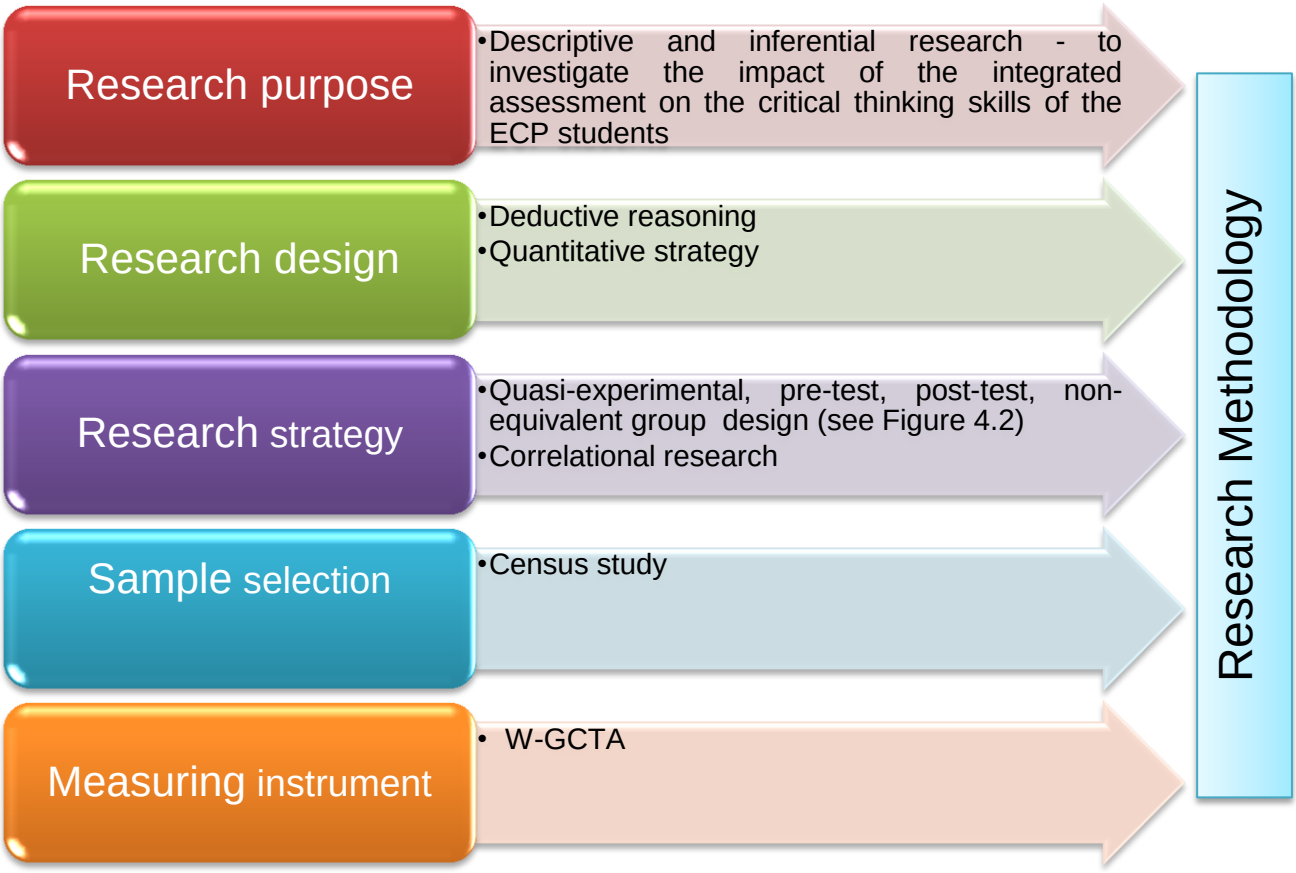
4.1 Introduction

The previous chapter examined the independent variable of the study, i.e., integrated assessments. The literature pertaining to integrated assessments within the higher education context as well as the relationship between integrated assessments and critical thinking were critiqued. This chapter will focus on the methodology used for the current study. The following aspects of the methodology will be explored: research design; target population; data collection instrument; data analysis; ethical considerations; delimitations; limitations as well as the reliability and validity of the study.

According to Leedy and Ormrod (2014: 96), data contain fragments of truth which are in an unrefined state and research methodology is the method that researchers use to extract meaning from the data, in order to solve the research problem. Similarly, Sekaran and Bougie (2013: 53-54) stated that a research study must be designed in such a way as to ensure that the required data can be collected and analyzed, in order to solve the research problem. Leedy and Ormrod (2014: 97) explained that different research problems result in different research designs. The impetus for the current study was the research problem/gap identified in chapter 1, i.e., the failure of higher education to inculcate critical thinking skills in its graduates, resulting in graduates being underprepared for the world of work.

The research purpose, strategy, design, sample selection as well as the data collection instrument used all form part of the methodology that the researcher employed in order to solve the research problem of the current study. Figure 4.1 provides an overview of the research methodology for the current study.

Figure 4.1 Overview of the research methodology for the current study



Source: Adapted from Gupta and Gupta (2011: 3)

The discussion will continue by examining the research design of the current study.

4.2 Research design

According to Mouton (2001: 55), research design is a plan indicating how the researcher proposes to steer the research study. Sekaran and Bougie (2013: 95) expounded on the concept by defining research design as a plan which is initiated by the research question. This plan details how data will be collected, measured and analyzed. When formulating the research design for the current study, the researcher was mindful of the type of study that would best address the research questions posed in chapter 1.

The current research was a quantitative descriptive experimental study based on hypothesis testing. It employed a quantitative strategy, with a quasi-experimental, pre-test, post-test, non-equivalent group design and it was longitudinal in nature. Each of these elements will be discussed further.

4.2.1 Descriptive study

The purpose of the current study, as mentioned in chapter 1, was to investigate whether the integrated assessment conducted with the first-year ECP students in the Department of Management Accounting at the Durban University of Technology has enhanced the critical thinking skills of these students. It was, therefore, a descriptive study, which was correlational in nature, since it is the researcher's intention to describe the relationship between the two variables, i.e., critical thinking (dependent variable) and integrated assessments (independent variable) (Sekaran and Bougie 2013: 97).

4.2.2 Deductive reasoning and hypothesis testing

According to Sekaran and Bougie (2013: 26,392), deductive reasoning involves applying a general theory to a particular problem or case. Mouton (2001: 117) stated that deductions are drawing conclusions from the evidence provided. Similarly, Leedy and Ormrod (2014: 18) explained that deductive reasoning is important in formulating the research hypothesis as well as the testing of research theories. Sekaran and Bougie (2013: 26) concurred that hypothesis testing requires deductive reasoning since the researcher tests to determine if the general theory is able to explain the problem that initiated the research study. The problem that initiated the current research study was supported by empirical evidence provided in chapter 2. This evidence supported the theory that graduates are underprepared for the world of work, and that the ability to think critically can assist them to be effective in the workplace. The hypotheses of the current study, as highlighted in chapter 1, was deductively derived from the above theory.

4.2.3 Quantitative strategy

The quantitative strategy involves the collection and analysis of numerical data in a logical and objective way (Maree and Pietersen 2007: 153). Leedy and Ormrod (2014: 97) stated that researchers who employ a quantitative strategy use the following steps: formulation of the research hypothesis that must be tested; isolation of the variables to be studied; use of standardized procedures to collect numerical data of some form; utilization of statistical procedures to analyze the data; and making deductions or drawing conclusions from the data.

In addition, Leedy and Ormrod (2014: 98 and 99) affirmed that researchers would choose the quantitative method based on the purpose, process, data collection, data analysis and the reporting of findings required by the research study:

- *Purpose*: Does the researcher seek to establish or confirm a relationship between the research variables?
- *Process*: Does the researcher need to measure the research variables objectively?
- *Data collection*: Does the researcher need to collect data that is only related to the research variables and can the researcher identify, develop and standardize methods of measuring each research variable?
- *Data analysis:* Does the researcher need to make use of deductive reasoning in order to draw logical conclusions?
- *Reporting of findings*: Does the researcher need to condense the data using summarising statistics such as means, medians, and correlations? Does the researcher need to report on the data using a scientific and formal style?

The researcher chose to employ a quantitative strategy for the current research study based on the following reasons: it was the researcher's intention to establish a relationship between the variables 'critical thinking' and 'integrated assessments'; the researcher needed to measure the afore-mentioned variables objectively; and the

researcher used the W-GCTA-UK edition, which is a standardized test, to measure the critical thinking skills of the first-year ECP students. The appropriateness of this measuring instrument will be discussed in the latter part of the current chapter. In chapter 5, the researcher used summarizing statistics and drew conclusions based on deductive reasoning.

According to Maree and Pietersen (2007: 149), a quantitative research design can either be experimental or non-experimental. There are a variety of experimental designs that exist, but the experimental design chosen for the current research study was the quasi-experimental design. This type of experimental design will be discussed further.

4.2.4 Quasi-experimental, pre-test, post-test, non-equivalent group design

An experimental design requires the researcher to control the independent variable and analyze what effect it has on the dependent variable (Leedy and Ormrod 2014: 240). With experimental designs, the objective is to determine the effect of a treatment or intervention on the research participants (Reichardt 2009: 46). In the current research study, the researcher sought to determine whether the intervention, i.e., the integrated assessment, had the desired effect on the critical thinking skills of the first-year ECP students.

The experimental design chosen by the researcher was not a pure experimental design, but rather a quasi-experimental design, since participants were not randomly assigned to either the control or experimental group, but were purposefully chosen (Reichardt 2009: 54; Leedy and Ormrod 2014: 242). The researcher's decision was reinforced by empirical evidence provided by the study of Behar-Horenstein and Niu, which reviewed 42 empirical studies on the teaching of critical thinking. These authors recommended that researchers should use a quasi-experimental design since the studies that used a true experimental design failed to find a statistical significant change in the post-test data (Behar-Horenstein and Niu 2011: 25,34).

There are a variety of quasi-experimental designs that exist, but the researcher chose to use a quasi-experimental, pre-test, post-test, non-equivalent group design. In this design, there are two groups, i.e., an experimental group and a control group. Participants were purposefully assigned to either the control or the experimental group, since randomization proved impractical for the following reason. The course requirements for the control group and the experimental group were different. The control group consisted of first-year students registered for the National Diploma in Accounting, and the experimental group consisted of first-year students registered for the National Diploma in Cost and Management Accounting. Both groups had a common subject in their first year, i.e., Accounting Professional Practice. However, this subject was assessed differently by the respective departments. The experimental group was required to complete an integrated assessment in order to pass the subject Accounting Professional Practice, while the control group was not required to complete an integrated assessment in order to pass the subject Accounting Professional Practice. Consequently, the two groups were conveniently and purposefully chosen. This design required both groups, i.e., the experimental and control groups, to undergo a pre-test measure, i.e., the W-GCTA. The intervention, which was the integrated assessment, was then administered to the experimental group only. Once the experimental group completed the integrated assessment, which was approximately 6 months later, both groups were then required to undergo a post-test measure, i.e., the W-GCTA.

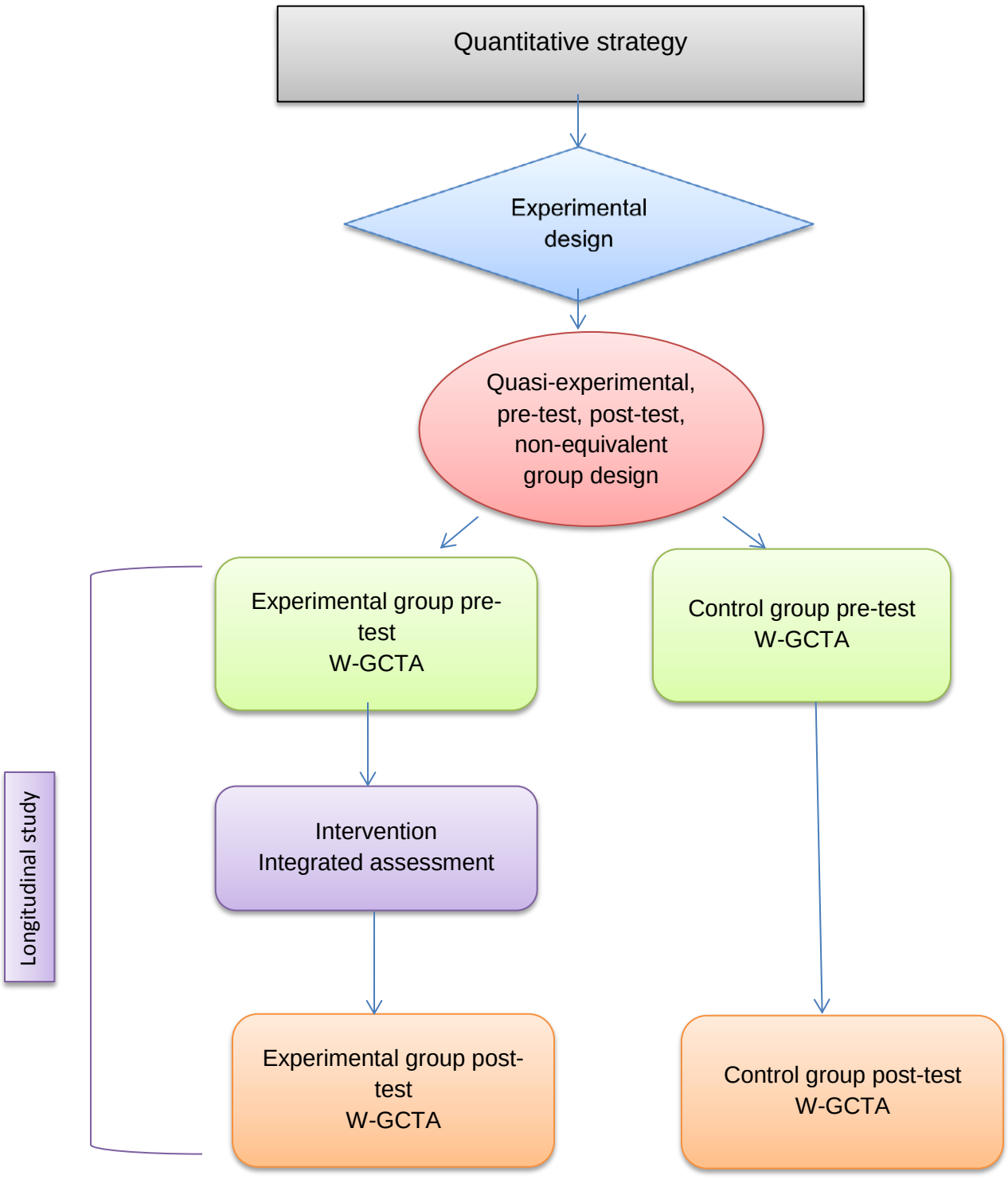
4.2.5 Time horizon: Longitudinal study

To answer the research question, the researcher can either collect data once or more than once, at various points in time. Research studies, where data is only collected at one point in time, are termed cross-sectional or one-shot studies (Bryman and Bell 2011: 53; Sekaran and Bougie 2013: 106). However, longitudinal studies collect data on the dependent variable at two or more points in time (Sekaran and Bougie 2013: 107). Since the aim of the current research study was to determine the probable gains in students' critical thinking over a period of time, i.e., after the completion of the integrated assessment, it was more appropriate to use the longitudinal study method. The current

research study collected data at two points in time, i.e., prior to the integrated assessment and after the completion of the integrated assessment. The aim was to measure the change, if any, in the students' critical thinking skills over a period of time. Since data was collected at two different points in time, this study was a longitudinal one.

In measuring the gains in students' critical thinking skills, Lierman (1997), Arburn (1999), Teixeria (2001) and Boyadjian-Samawi (2006), as cited by Behar-Horenstein and Niu (2011: 35), advocated the use of longitudinal studies that exceed four months. According to the authors, a longer treatment/intervention was necessary in order to detect statistical significant changes in the critical thinking skills of students. In line with the authors' recommendation, the current study used an intervention that extended from the end of March to the beginning of September, i.e., approximately 5 months long. Figure 4.2 represents an overview of the research design of the current study.

Figure 4.2 Overview of the research design



Source: Self-generated

4.3 Target population

The choice of suitable participants is an important component of a research study, as it can have an impact on both the internal and external validity of the study (Graziano and Raulin 2013: 201). When selecting the research participants, the researcher, firstly, delineates the population. According to Sekaran and Bougie (2013: 240,397), the population refers to the whole group of people, objects or events that the researcher would like to investigate. A sample, on the other hand, is a portion or subset of the population that the researcher has selected to be investigated (Bryman and Bell 2011: 176). The target population identified for the current study consisted of:

- *The experimental group:*
  All the first-time registrations for the National Diploma: Cost and Management Accounting (Extended Curriculum Programme) in the Department of Management Accounting at the Durban University of Technology in 2014; and
- *The control group:*
  All the first-time registrations for the National Diploma: Accounting (Extended Curriculum Programme) in the Department of Financial Accounting at the Durban University of Technology in 2014.

Each of the aforementioned groups comprised of approximately 40 students. The size of the population was in line with a requirement of the Department of Higher Education and Training. In a communication with the Vice-Chancellor of the DUT, Prof A Bawa, the Minster of Higher Education and Training, Dr BE Nzimande, stated that the university should target at least 20% of the first-time registrations as ECP/foundation students.

The first-time registrations for the main stream programmes in the Department of Management Accounting and Financial Accounting was approximately 200 students, which was based on their capacity. Twenty percent of 200 equates to 40 students, who

were placed on the ECP programmes. The remaining 160 students, in each department, were placed on the main stream programme. The departmental entry requirements were used to identify those students who were underprepared for higher education. The Mathematics and English percentages obtained by the students in the national senior certificate examination, was used as the basis for streaming students for either the mainstream or extended programme. The Department of Higher Education and Training (Department of Higher Education and Training) cautioned universities not to use the ECP as a means of enrolling more than the planned first-time enrolments for a certain year, as these additional students would not be state funded under the block grants (Department of Higher Education and Training 2012: 3). The DHET requirement restricted the population size. Consequently, no sampling was necessary. The current study gathered and investigated data from every group member within the population and is, therefore, viewed as a census study (Saunders, Lewis and Thornhill 2012: 666).

4.4 Measuring instrument (Watson-Glaser Critical Thinking Appraisal)

According to Sekaran and Bougie (2013: 24), in order to test the hypothesis of the research study, the variables identified in the theoretical framework must be measured in some way. The dependent variable (critical thinking) and the independent variable (integrated assessment) were identified in the theoretical framework covered in chapter 3. The Watson-Glaser Critical Thinking Appraisal UK-edition was the instrument that the researcher chose to measure the critical thinking skills of the first-year ECP students in the Department of Management Accounting (experimental group) and the Department of Financial Accounting (control group). The experimental group was exposed to the intervention of the integrated assessment, in order to determine if this assessment enhanced the critical thinking skills of these students.

Foxcroft and Roodt (2009: 65) stated that the development of a psychological test is a time-consuming and people-intensive process, which requires advanced psychometric knowledge as well as expertise related to test development. According to the authors,

this process could take a minimum of three to five years. Consequently, the researcher did not develop an instrument to be used for the current study, but opted rather to use an existing standardized critical thinking test, i.e., the W-GCTA. The use of an existing standardized critical thinking test has two main advantages: it saves time and money, and the reliability and validity of the instruments do not need to be established. Behar-Horenstein and Niu (2011: 37) also cautioned against the use of non-standardized critical thinking tests, where the scoring of the test is subjective and the validity and reliability of the instrument cannot be established. Leedy and Ormrod (2014: 83) concurred that the use of an incorrect measurement tool will not solve the research problem.

Since critical thinking is an abstract concept and the experts have disagreed on how it should be measured (Paul 1985, as cited by Ku 2009: 72), numerous standardized psychometric tests are available on the market that measure critical thinking. A review of the literature revealed that the most commonly used measures of critical thinking were as follows: the Watson-Glaser Critical Thinking Appraisal (W-GCTA); the Cornell Critical Thinking Test (CCTT); the California Critical Thinking Skills Test (CCTST); the Ennis-Weir Critical Thinking Essay Test (EWCTET); and the Halpern Critical Thinking Assessment Using Everyday Situations (HCTAES) (Ku 2009: 72). The W-GCTA, CCTST and the CCTT are multiple choice measures, while the EWCTET and the HCTAES are open- ended measures. The researcher was guarded against using a test measure which required students to be proficient in academic writing, as the ECP students, who were the subjects of research study, had been identified as being underprepared for higher education (Adams, Whitlow, Stover, & Johnson 1996, as cited by Ku 2009: 73). Despite the fact that the W-GCTA required students to have a reading ability of 15 years, a pilot study was conducted with the Auditing ECP students to ensure that the W-GCTA was appropriate for use with ECP students (Lombard, K and Grosser 2008: 567).

The W-GCTA is a psychometric test which measures the cognitive skills of critical thinking (*Watson-Glaser critical thinking appraisal user guide and technical manual* 2012: 3 and 5). There are currently 3 versions of the test that are available in the United Kingdom, i.e., Form C: 80 item, paper and pencil test; Form D: 40 item, paper and pencil; and the unsupervised 40 item test (on-line) version (*Watson-Glaser critical thinking appraisal user guide and technical manual* 2012: 13). The researcher chose to use the Form C, since this version of the test was administered within the SA context, in the Lombard and Grosser study of 2008, thus making the establishment of a norm group for South African students, against which comparisons can be made (Lombard, K and Grosser 2008: 565).

Further reasons why the researcher chose to use the W-GCTA to collect quantitative data will be explored.

4.4.1 Selection of the Watson-Glaser Critical Thinking Appraisal

As mentioned in chapter 2, it is the most widely used measure of critical thinking in the world. The decision to use the W-GCTA was based on the following reasons:-

- The instrument has a long history and has been used in numerous countries and settings, including South Africa (Watson and Glaser 2002: 1.1);
- A discipline specific critical thinking test is not available within the South African context;
- Although the instrument is not discipline specific, it requires students to use critical thinking skills that are necessary within the higher education context (Blattner & Frazier, 2002:48; Wessels & Williams, 2004:80, as cited by Pieterse 2012: 25); and
- The test comprises of 5 subtests, which enable educators to isolate areas of deficiency in the students' critical thinking skills, which can inform appropriate future assessments (Bernard, R. M., Zhang, D., Abrami, P. C., Sicoly, F., Borokhovski, E. and Surkes, M. A. 2008: 16,17).

4.4.2 Structure of the Watson-Glaser Critical Thinking Appraisal

The W-GCTA is a multiple choice measure that comprises of 5 subtests, which measure the following cognitive skills: inferences, recognition of assumptions, deductions, interpretation and evaluation of arguments. In each of the 5 subtests, the respondents are required to:

- *Test 1: Inferences*
  Draw the correct conclusions from the factual statements provided;
- *Test 2: Recognition of assumptions*
  Detect the implied assumptions in given statements;
- *Test 3: Deductions*
  Decide whether the proposed conclusions follow rationally from the information given;
- *Test 4: Interpretation*
  Judge, based on the information provided, if the proposed conclusions drawn are merited; and
- Test 5: Evaluation of arguments
  Evaluate the strength and applicability of the proposed arguments.

The test comprises of 80 questions in total, subdivided into 16 questions per subtest. All the items in each subtest are discipline neutral and the situations used in the test are based on topics encountered on a daily basis. These include social, political and economic issues (Ku 2009: 72). The test includes both neutral and controversial material, therefore, indicating respondents' ability to think critically, irrespective of whether or not they have strong feelings about the issue at hand (*Watson-Glaser critical thinking appraisal user guide and technical manual* 2012: 30). Each subtest is preceded by specific directions and examples that the respondents must comply with, when answering the test. Respondents have 50 minutes to complete the test, with a maximum of 10 minutes being allocated for administration issues, giving a total time of

60 minutes. In line with the requirements, as laid down in the W-GCTA user guide and technical manual, the following must be adhered to:

- the test must be administered by a trained test administrator who is familiar with the test;
- the test must be scored properly; and
- appropriate norm groups must be identified, from the available norm groups provided (*Watson-Glaser critical thinking appraisal user guide and technical manual* 2012: 53-58).

The researcher ensured that the above requirements were adhered to. A test administrator, with an appropriate qualification in test use, conducted both the pre-and post-tests. The scoring of both the pre-test and post-test was done in accordance with the instructions laid down in the W-GCTA user guide and technical manual. In addition to the SA norm group, which was identified in the Lombard and Grosser study of 2008, two other appropriate norm groups were used to aid interpretation of results. These norm groups were as follows: US first year of 4 year college students and US high school grade 12 students. These norm groups will be discussed further in chapter 5.

The integrated assessment was the intervention to which the experimental group was exposed. The structure of this assessment will be examined.

4.5 Intervention (Integrated assessment)

As mentioned in chapter 3, an integrated assessment is " a holistic approach, in that the tasks combine the assessment of a variety of different skills at the same time; and/or assess a number of outcomes together; and/or assess a number of assessment criteria together; and/or use a combination of assessment methods and instruments; and/or acquire evidence from other sources, for example, portfolios, journals, logbooks, supervisor reports" (Durban University of Technology. Centre for Excellence in Learning and Teaching 2014: 6). An integrated assessment was designed in 2010 for the first-year ECP students in the Department of Management Accounting with the support of

the Centre for Excellence in Learning and Teaching at the DUT. The aim of this integrated assessment was to enhance the critical thinking skills of the aforementioned students and, consequently, prepare them for subsequent levels of study. The exit level outcome for the National Diploma: Cost and Management Accounting as well as the Critical Cross Field Outcomes (CCFO's) formed the basis for the development of the integrated assessment.

4.5.1 Structure of the integrated assessment

The integrated assessment comprised of 5 individual assessments. An overview of each assessment is presented in Figure 4.3.

Figure 4.3 Overview of the individual assessments which constittuted the integrated assessment

Source: Self-generated

As mentioned in chapter 3, the integrated assessment was a group assessment. This ensured that students learnt to work collaboratively, which is a necessary skill required

in the work environment (Lombardi 2008: 8). The assessments had to be completed in the specified order, with each assessment providing a scaffold for the next. This scaffolding ensured that students could see the link between the individual assessments, as well as the overall requirement of designing a business plan for a chosen small business. This overall requirement was aligned to the exit level outcome for the National Diploma: Cost and Management Accounting, i.e., graduates being capable of practising as accountants and rendering accounting services to commerce, industry and the public sector.

Table 4.1 Requirements of the individual assessments and the CCFO's assessed

Assessment number	Assessment requirements	CCFO's assessed (South African Qualifications Authority 2006: 2)
1	**Research the need for the development and sustainability of small businesses** Each group was required to write a report that highlighted the need for the development and sustainability of small businesses. This report had to include the following: • the most recent developments with regards to small business development and sustainability; and • at least 2 examples of small businesses that have had an impact on the economy and on community upliftment.	• Working effectively with others as a member of a group; • Collecting, analyse, organise and critically evaluate information; and • Communicating effectively using language skills in the form of written persuasion.
2	**Negotiate a relationship with an existing small business** Each group was required to prepare a report that provided the details of the establishment of a relationship with a chosen small	• Working effectively with others as a member of a group; • Collect, analyse, organise and critically evaluate

	business. The chosen small business had to be in the surrounding area of the DUT. This report had to : • Document all the businesses approached and briefly outline the reasons why certain businesses did not want to participate; • Describe the problems encountered and indicate how these problems were resolved, in terms of establishing a relationship with a small business; • Summarize the reasons or motivation used to establish the relationship; and • Provide a letter of consent, which can be written or recorded (if verbal), clearly indicating the businesses willingness to participate. Photographs and videos must be provided as evidence of the established relationship.	information; and • Communicating effectively using language skills in the form of oral and written persuasion.
3	**The business operations of the macro and micro business** The students went on an arranged excursion to a macro business within the production industry, in the week ending the 10th of May 2014. Prior to the excursion, each group was given a questionnaire, which elicited information, about the business operations. Post excursion, each group was required to prepare a report. This report had to: • highlight the observations made on good business practices; • highlight observations made	• Working effectively with others as a member of a group; • Collect, analyse, organise and critically evaluate information; and • Communicating effectively using language skills in the form of written persuasion; and • Demonstrate an understanding of the world as a set of related systems

	pertaining to the factory layout, safety measures, cleanliness, etc.; • provide an explanation of the company's mission statement; and • include a basic mission statement drafted for the chosen small business.	by recognising that problem-solving contexts do not exist in isolation;
4	**Prepare a business plan** Prepare a business plan with a follow-up report, suggesting possible ways in which the chosen small business can improve their day- to-day operations and, consequently, make the transition from survivalist to a profitable entity that will exist in the foreseeable future. The business plan had to include the following: • Description of the business; • Financial plan; • Operational plan; and • Recommendations and conclusions.	• Working effectively with others as a member of a group; • Collect, analyse, organise and critically evaluate information; • Identifying and solving problems in which responses display that responsible decisions using critical and creative thinking have been made; • Communicating effectively using language skills in the form of written persuasion; • Demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation; and • Developing entrepreneurial opportunities.

5	**Presentation of the business plan** The business plan was to be presented using a Microsoft power point presentation. All group members were expected to take part in the presentation. A mark was awarded for individual as well as group presentations.	• Working effectively with others as a member of a group; and • Communicating effectively using language skills in the form of oral persuasion.

Assessments 1 to 4 required students to collect, analyse, organise and critically evaluate information, which is aligned to the skills of deduction, interpretation and evaluation of arguments, tested by the W-GCTA.

From the information provided on the structure of the integrated assessment, students had to solve a real-world problem; work collaboratively as a member of a team and adhere to timeframes laid down in the integrated assessment. These are essential skills required in the work environment. It is evident that the integrated assessment empowered students to think like practitioners and not like students.

4.6 Recruitment process and data collection method

In planning the administration of the W-GCTA pre-test and post-test, the researcher adhered to the guidelines as laid down in the W-GCTA user guide and technical manual. These guidelines were explicit and detailed the following:

- preparation required prior to the testing session;
- setting up of the testing session; and
- conducting the testing session (*Watson-Glaser critical thinking appraisal user guide and technical manual* 2012: 53-54).

Each of these guidelines will be explored further.

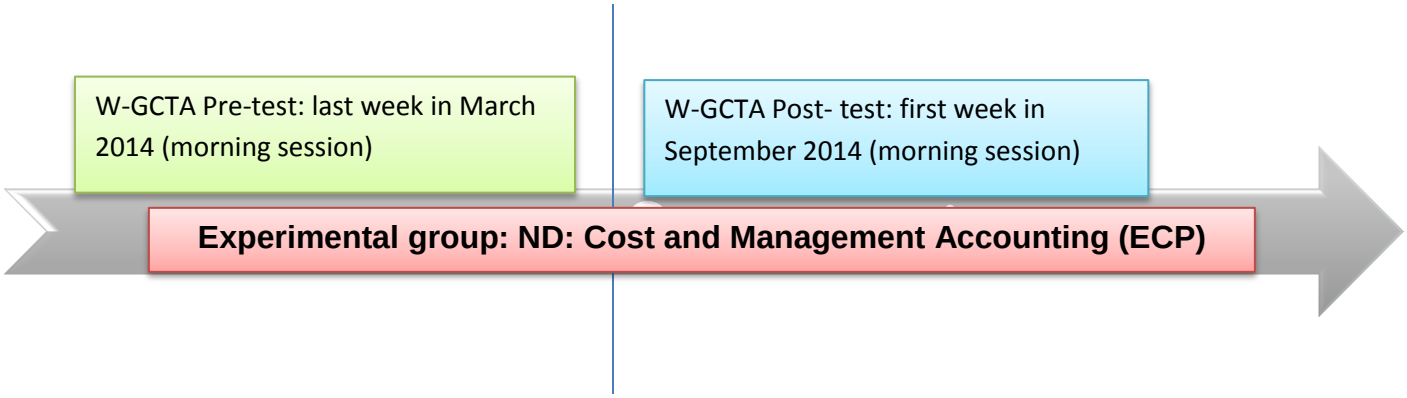
4.6.1 Preparation required prior to the testing session

Once the students had registered for the respective diplomas, Accounting or Cost and Management Accounting, the researcher then identified the individual students by obtaining class lists via the Integrated Tertiary Software System (ITS) used by the DUT. The researcher then met with the relevant groups and provided each student with a letter of information (Appendix A), as well as a letter of informed consent (Appendix B). The letter of information, which provided a brief introduction to the research study and highlighted the purpose of the study, was explained to the students. The researcher also ensured that the students were made aware of what was expected of them, i.e., the process to be followed. Students were allowed to ask questions and the researcher provided explanations, where necessary. The letter of informed consent will be explained in the latter part of the current chapter, under ethical considerations. Prior to the collection of data, the researcher ensured that gatekeeper's permission (Appendix C) was received from the relevant heads of department as well as the programme coordinator. In addition, ethical clearance (Appendix D) was also received before data was collected.

The researcher booked a venue in the tutorial block for both the pre-test and post-test. When deciding upon the dates for the tests, the researcher consulted the academic calendar and took cognizance of the faculty test weeks and the semester examinations. In terms of the academic calendar, there are two faculty test weeks prior to the semester examinations. Both the pre-test and the post-test were conducted after the faculty test weeks and prior to the semester examinations. The times chosen for conducting the tests were based on the students' availability during the lecture week. All five categories of the W-GCTA was administered to both the control and experimental groups at two points within the academic year, i.e., in the last week of March 2014 (pre-test) and first week in September 2014 (post-test). A register was taken for both the pre-test and the post-test. Figures 4.3 and 4.4 summarize the dates and sessions when the

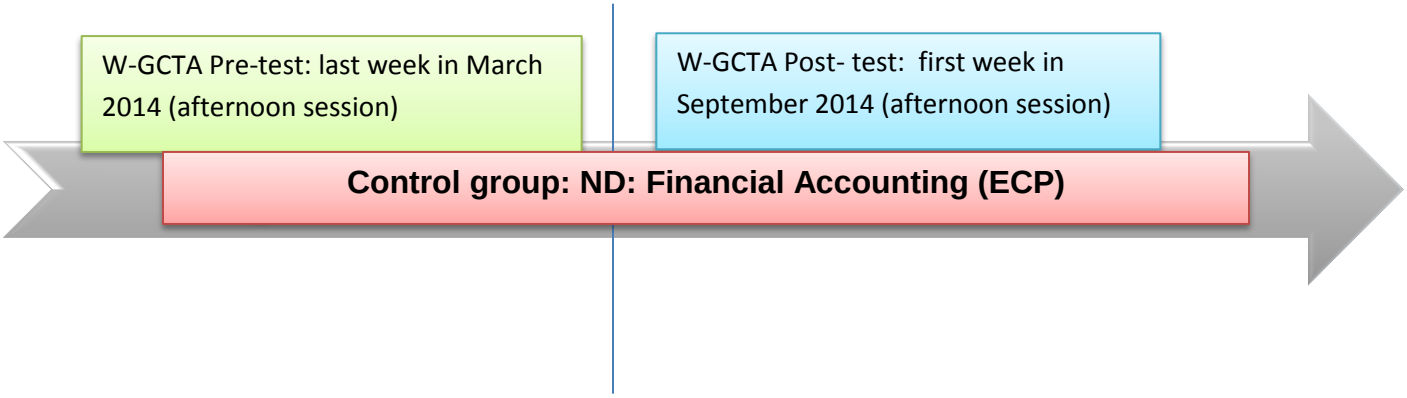
pre-test and post-test, for both the experimental and the control groups, were conducted.

Figure 4.4 Summary of the dates and sessions of the pre-test and post-test for the experimental group



Source: Self-generated

Figure 4.5 Summary of the dates and sessions of the pre-test and post-test for the control group



Source: Self-generated

4.6.2 Setting up the testing session

As mentioned earlier, the venue used for both the pre-test and post-test was the tutorial block. This tutorial block is situated on the Ritson Campus of the DUT. It is separate from the main lecture theatres, therefore making it ideal for the administering of tests, with minimum disruptions from other students. The venues in the tutorial block seat approximately 60 students, thus allowing sufficient space to be left between participants. The lighting in the venue was adequate and an air conditioner in the venue ensured that students were kept as comfortable as possible. Notices were placed outside the venue to ensure that the other students were made aware that testing was in progress.

4.6.3 Conducting the testing session

Both the pre-test and post-test were administered by a trained test administrator with the relevant qualifications. The test administrator followed the standardized test instructions as laid down in the W-GCTA manual. The same test administrator conducted both the pre-and post-tests and, consequently, developed a rapport with the students. The researcher merely acted as an observer during both the pre-and post-test sessions. Students were provided with the required stationery for both the pre-and post-test sessions.

Once the data had been collected, it needed to be analyzed using various statistical techniques. These techniques are discussed further.

4.7 Data analysis

According to Sekaran and Bougie (2013: 24), data analysis is using statistical techniques, to determine if the hypotheses developed for the research study can be strengthened. The statistical techniques employed in analyzing the data are dependent

upon the type of measurement scales used in the data collection instrument (Graziano and Raulin 2013: 78; Leedy and Ormrod 2014: 86). Quantitative data for the current study will be analyzed using the latest version of the Statistical Package for Social Sciences (SPSS) version 22.0, which was released in August 2013.

4.7.1 Measurement scales

Measurement is the process of restricting the data for interpretation and comparative purposes (Leedy and Ormrod 2014: 83). The data collected for the current study was measured, i.e., inspected, analyzed, interpreted and compared to a quantitative standard (Leedy and Ormrod 2014: 84). The quantitative standard used was the results obtained from the selected norm groups. Sekaran and Bougie (2013: 212) explained that there are four types of scales, i.e., nominal, ordinal, interval and ratio. These authors added that these scales were progressive, with a more detailed statistical analysis being generated from a ratio scale than a nominal scale. As mentioned earlier, the type of measurement scales used will determine the statistical techniques that can be employed in analyzing the data. The W-GCTA makes use of three types of scales, nominal, ordinal and dichotomous as follows: biographical details (nominal scales); subtest 1 (ordinal scale); and subtests 2, 3, 4 and 5 (dichotomous scales). These scales are also known as non-interval scales (Leedy and Ormrod 2014: 89). The characteristics and statistical techniques that can be employed in analyzing the data from these non-interval scales will be discussed further.

Nominal scales are “naming scales”, which are used to place respondents into various categories (Graziano and Raulin 2013: 81). The W-GCTA used nominal data to place respondents into the following six categories: sex, age, disability, sexuality, religion and ethnic group. There are limited statistical techniques which can be used to analyze such nominal data. These include: the frequency of respondents in a particular category (mode); the percentage of respondents within the various categories; and the chi-

square test, which indicates whether an observed pattern is coincidental or not (Sekaran and Bougie 2013: 289; Leedy and Ormrod 2014: 87).

Ordinal scales categorize and rank-order data, in terms of greater than or less than, without being specific regarding the size of the interval (Leedy and Ormrod 2014: 87,89). The statistical techniques which can be used to analyze the ordinal data include: determining the central point in a set of data (median); the percentile rank to establish the relative position of an individual within in a group; the extent of the relationship between two characteristics (Spearman's rank order correlations) (Leedy and Ormrod 2014: 88) .

Dichotomous scales contain data that only has two categories (Bryman and Bell 2011: 341). According to Sekaran and Bougie (2013: 218), these scales can be used to prompt a yes or no response. These scales are applicable to subtests 2 to 5 of the W-GCTA. Subtest 2: recognition of assumptions; subtest 3: deductions; and subtest 4: interpretation require a yes or no response, while subtest 5: evaluation of arguments require a strong or weak response.

The assumption pertaining to parametric statistics is that the data shows an interval or ratio scale and falls within a normal distribution (Leedy and Ormrod 2014: 294). Since nominal and ordinal scales do not reflect a normal distribution, the current study will employ nonparametric statistics. The descriptive and inferential statistics used for the current study will be explored.

4.7.2 Descriptive statistics

Gupta and Gupta (2011: 32) explained that descriptive statistics provide an elementary and concise analysis of the data. It describes the set of data, using statistics such as

frequencies, mean and standard deviation (Sekaran and Bougie 2013: 393). The descriptive statistics used for the current study included: frequency distributions and various types of graphs.

The frequency distributions as well as the graphs are known as univariate analysis, since they involve the analysis of one variable at a time (Bryman and Bell 2011: 342). Frequency distributions indicate the number of times or frequency with which each score value occurs (Gupta and Gupta 2011: 34). Percentages and cumulative percentages can be calculated from any of the occurrences (Sekaran and Bougie 2013: 283). The current study used frequencies, with percentages and cumulative percentages to analyze the biographical details of both the control and experimental groups. Gupta and Gupta (2011: 34) stated that frequencies can either be represented graphically or in tabular format. Since the current study makes use of nominal and ordinal scales, the graphical format in the form of bar and pie graphs were appropriate (Gupta and Gupta 2011: 34). These diagrams will be discussed further.

Diagrams are often used to display quantitative data. The main advantage is that they are easy to understand and interpret (Bryman and Bell 2011: 343). The current study made use of bar and pie graphs for the quantitative data of the study, i.e., biographical details. According to Cortinhas and Black (2012: 31), a bar graph is a chart that depicts data in the form of bars. It has two axes, one axis contains two or more classifications and the other axis contains a sequence of bars, one for each classification. Furthermore, the authors explained that the length of the bar represents the size of the measure for each classification, and that bar graphs can either be depicted horizontally or vertically. Horizontal bar graphs are known as bar charts, while vertical bar graphs are known as column charts (Cortinhas and Black 2012: 32). A pie graph is a chart, which depicts the data in the form of a circle. The area of the whole circle/pie represents 100% of the data and each slice of the pie signifies the percentage breakdown of the subcategories, i.e., the size of the subcategory in relation to the whole (Cortinhas and Black 2012: 30).

4.7.3 Inferential statistics

Sekaran and Bougie (2013: 394) explained that inferential statistics are used to establish a relationship and draw conclusions from variables. Establishing a relationship is using correlation statistics while drawing conclusions therefrom is testing a hypothesis. As mentioned earlier, the inferential statistics used for the current study were nonparametric statistics, due to the nature of the data.

Correlation analysis involves the use of correlational statistics to determine the mutual impact of variables on each other (Sekaran and Bougie 2013: 392). Similarly, Leedy and Ormrod (2014: 303) stated that correlation determines whether two or more variables are associated with one another in some way. Further, the authors stated the statistics derived is called a correlation coefficient which lies between -1 and +1, with a positive number indicating a positive correlation and a negative number indicating a negative correlation. With a positive correlation, as one variable increases, so does the other variable increase. With a negative correlation, as one variable increases, the other variable decreases. The size of the correlation coefficient is also important. Numbers which are closer to 1, either -1 or + 1, indicate a strong correlation and a number closer to 0 indicates a weak correlation. It is necessary to discern if the correlation discovered between two variables is significant or not, i.e., is the correlation due to chance or is there a high probability that the correlation actually exists (Sekaran and Bougie 2013: 290)? To establish a correlation for the current study, the researcher used the Pearson correlation at a significance level of 95% i.e. ($p < 0.05$). The Pearson's r-value indicated the strength of the relationship.

The researcher was mindful of the fact that correlation does not essentially indicate causation; it reveals that an association is evident in the variables, but does not reveal the nature of the association (Leedy and Ormrod 2014: 305). It is, therefore, essential to test the hypothesis of the current study in order to reveal the nature of the associations. The conventional approach to report results requires the researcher to state the statistical significance. Statistical significance means that it is unlikely that the

findings are due to chance, i.e., the null hypothesis is likely to be false (Graziano and Raulin 2013: 115). The statistical method employed to test the hypothesis of the current study was the Mann-Whitney *U* test. The Mann-Whitney *U* test is a nonparametric test which compares the mean of two independent populations. It is based on the assumptions that the samples are independent and that data are ordinal in nature (Cortinhas and Black 2012: 721). The two-tailed hypotheses being tested with the Mann-Whitney *U* test are as follows:

H_0: the ECP Financial Accounting and ECP Cost and Management Accounting groups are identical; and

H_1: the ECP Financial Accounting and ECP Cost and Management Accounting groups are not identical.

Regression analysis is a mathematical model that is constructed to predict one variable by another variable or other variables (Cortinhas and Black 2012: 826). The variable to be predicted is the dependent variable denoted as y, while the predictor is the independent variable (explanatory variable), denoted as x. A multiple regression model was constructed for the current study, since the variable to be predicted was critical thinking ability, using multiple predictors, i.e., the five subtest scores. The regression equation for the model is as follows.

$$y= \beta_0+ \beta_1x_1+ \beta_2x_2 + \beta_3x_3 +\beta_4x_4 +\beta_5x_5 + \varepsilon$$

where:

y= the dependent variable critical thinking;

β_0 = the regression constant;

β_1= the partial regression coefficient for independent variable subtest 1: Inferences;

β_2= the partial regression coefficient for independent variable subtest 2: Recognition of Assumptions;

β_3= the partial regression coefficient for independent variable subtest 3: Deduction;

β_4= the partial regression coefficient for independent variable subtest 4: Interpretation;

β_5= the partial regression coefficient for independent variable subtest 5: Evaluation of Arguments; and

ε= the error of prediction.

The partial regression coefficient of the independent variable β indicates the increase in y that will result from a one unit increase in that specific independent variable provided all the other variables remain constant (Cortinhas and Black 2012: 547-548).

4.8 Pilot testing

According to Leedy and Ormrod (2014: 205), the purpose of a pilot test is to establish the validity of the data collection instrument. This is to ensure that the data collection instrument is capable of eliciting the information required in order to solve the research problem. Both the W-GCTA and the integrated assessment were piloted.

Piloting of the W-GCTA

The development of the W-GCTA dates back to the 1920's. This instrument has had a number of refinements since its development and has been used in numerous academic settings. Numerous empirical studies have provided evidence of the construct validity of the W-GCTA (*Watson-Glaser critical thinking appraisal user guide and technical manual* 2012: 31). Validity will be discussed in more detail in the latter part of the current chapter.

The researcher conducted a pilot test with the first-year Auditing ECP students. This was to establish the understandability of the test questions (Gupta and Gupta 2011: 11). These students were independent from the target population identified for the current study. This group comprised of 20 students. As mentioned earlier, the construct validity of the W-GCTA had already been established. Therefore, the purpose of the pilot test

was not to establish the reliability of the W-GCTA, but to ascertain if the students, who were predominantly English second language students, had problems understanding the language used in the test. The Auditing ECP students were provided with a brief explanation of the purpose and aim of the current study. They were provided with a letter of information and were required to sign a letter of informed consent, prior to the pilot study being conducted.

The W-GCTA practice test was used for the pilot study. This test consisted of only 17 questions, but tested all 5 categories of the cognitive skills tested by the 80-item test. It was evident from the students' responses in the pilot test that they had not experienced any problems understanding the requirements of the test and that the language used in the test was understandable.

Piloting of the integrated assessment

The intervention, i.e., the integrated assessment, was developed in 2010 in consultation with the Centre for Excellence in Learning and Teaching at the DUT. This integrated assessment has been implemented and conducted with the ECP students since 2011. Minor amendments were made to the integrated assessment since its development. These included: the rewording of the assessment requirements, to ensure clarity; and the inclusion of a year planner which detailed the timelines and due dates of the individual assessments.

4.9 Delimitations of the research study

As mentioned in chapter 2, critical thinking involves both cognitive skills as well as dispositional attitudes. The current study focuses on the cognitive skills of critical thinking and not the dispositional attitudes of the first-year Extended Curriculum students in the Departments of Management Accounting and Financial Accounting at the Durban University of Technology. This is due to the fact that the instrument that was

used to measure the critical thinking skills of these students, i.e., the W-GCTA-UK edition is a multiple choice measure which does not adequately measure dispositional abilities (Ku 2009: 70). Further to this, the study only explored the assessment of the aforementioned cognitive skills and not the teaching of these skills.

The current study used a quasi-experimental research design and not a pure experimental design, since participants were not randomly assigned to either the experimental or control groups. The randomization of the pure experimental design minimizes the confounding variables. However, randomization would have been unethical since the students who were required to complete the integrated assessment, i.e., the experimental group, in order to pass the subject Accounting Professional Practice, may have been assigned to the control group, who were not required to complete the integrated assessment, thereby resulting in these students failing the aforementioned subject. Consequently, the participants were purposefully chosen and assigned to either the experimental or control groups based on the qualification for which the students had registered.

4.10 Limitations

The data collection instrument and sample size were limitations of the current study. Although the W-GCTA has a long history and has been used in numerous countries and settings, including South Africa, an instrument designed specifically for the South African context would have been more appropriate. From the literature reviewed, it was evident that such a culturally appropriate critical thinking test is not available at present within South Africa (Lombard, K and Grosser 2008: 566). It is hoped that further research would be conducted in this area and that a critical thinking test be designed specifically for the South African context.

Ideally, the researcher would have preferred to use a larger sample but was restricted by the Department of Higher Education and Training requirement. The small sample size, coupled with the high attrition rate in the post-test, weakened the study. A review of the literature on studies related to critical thinking also cites small sample size and high attrition rates as limitations (Behar-Horenstein and Niu 2011: 34). Based on these limitations, the researcher will be circumspect when drawing casual conclusions and generalizing the results of the current study.

Although validity and reliability of the W-GCTA has been established by numerous empirical studies, it is imperative that the researcher establishes the validity and reliability of the instrument for the current study within the local context (Lombard, K and Grosser 2008: 568).

4.11 Validity

According to Sekaran and Bougie (2013: 400) and Leedy and Ormrod (2014: 91), validity refers to the degree to which the data collection instrument measures what it is intended to measure. The face, content, construct and criterion validity of the W-GCTA will be investigated.

- *Face validity*

  Examines whether on face value, the items in the test read as if they measure critical thinking (Sekaran and Bougie 2013: 394). On face value, it is evident that the W-GCTA is an instrument that measures all five categories of critical thinking.

- *Content validity*

  Reflects how well the test delineates the elements and dimensions of critical thinking (Sekaran and Bougie 2013: 392). The W-GCTA comprises of five subtests, each constructed in accordance with the authors' definition of the concept of critical thinking.

- Construct validity

Provides evidence of how well the results obtained from the test confirm the theories around which the test was designed (Sekaran and Bougie 2013: 392). All five subtests of the W-GCTA measure the cognitive domain of critical thinking. There is a high level correlation in terms of what the literature reveals about the cognitive dimension of critical thinking and the various subtests of the W-GCTA.

- Criterion validity

Is when the measure separates individuals based on the criterion that it is anticipated to predict (Sekaran and Bougie 2013). The W-GCTA has been used in a variety of settings to separate individuals in terms of their performance.

The internal validity and external validity of the study was enhanced by the following:

- The control group and experimental group have been closely matched. Both these groups have been identified as being underprepared and not being able to manage with the higher education workload, due to their educational backgrounds;
- The instrumentation bias was nullified, since the same test was administered to both groups before and after the intervention; and
- The external validity of the study was enhanced by the intervention which reflects the work environment. To enhance the external validity of this study, a pilot test was conducted using the W-GCTA-UK edition practice test.

4.12 Reliability

Reliability confirms the consistency and stability of the measuring instrument (Sekaran and Bougie 2013: 398). According to Behar-Horenstein and Niu (2011: 31), the W-GCTA has been widely used and the experts have established its reliability. The reliability of instrument is also ensured since this instrument has been previously administered in the South African context and a norm group, therefore, does exist.

Reliability is calculated by taking several measurements on the same subjects. It is expressed as a coefficient which ranges from 0 – 1 (*Watson-Glaser critical thinking appraisal user guide and technical manual* 2012: 22). A reliability coefficient of 0.70 or higher is considered as "acceptable" (Gupta and Gupta 2011: 66). Values below 0.7 suggest that the test has limited applicability; it may be used to provide developmental feedback but is not appropriate for making selection decisions. For the current study, the W-GCTA was used for diagnostic purposes to ascertain the areas of cognition that require additional attention.

To establish the reliability of the W-GCTA within the local context, the researcher used the Guttman Split-Half. The Guttman split half is an internal consistency reliability measure which measures the degree to which responses on the different parts of the test are consistent with the overall score. Split-half reliability shows the correlation between the two halves of the instrument (Sekaran and Bougie 2013: 229). If the test is reliable, it is expected that those students who scored the highest on one half of the test, would also score high marks on the other half of the test (*Watson-Glaser critical thinking appraisal user guide and technical manual* 2012: 22).

4.13 Ethical considerations

According to Leedy and Ormrod (2014: 106-108), when the researcher undertakes a research study that involves human beings, it is imperative that they explore the ethical issues surrounding their study. Furthermore, these authors explained that ethical issues fall into 4 categories, i.e., protecting research participants from harm; voluntary and informed participation; participants' right to privacy; and honesty with professionalism. Each of these categories will be discussed further.

Protection from harm

In the current study, participants were not exposed to any physical or psychological harm. In terms of the letter of information provided, the research participants were required to complete the W-GCTA pre-test and post-test. There was no risk involved in this activity, since, as students, they had been exposed to numerous tests during their schooling career. The W-GCTA was only an hour long. Therefore, students were not subjected to undue stress culminating from a long testing process.

Voluntary and informed consent

The letter of informed consent accompanied the letter of information. All the research participants, including those involved in the pilot study, were requested to sign the letter of informed consent before the WGCTA pre-test and post-test were conducted. In the letter of informed consent, the research participants were provided with a choice to participate in the research study and were given the opportunity to withdraw from the research study at any point in time. The researcher did not pressurize the participants in any way; their participation in the research study was strictly voluntary. This is evident from the high attrition rate which will be discussed in chapter 5.

Participants' right to privacy

To ensure the anonymity of all the research participants, the researcher allocated a number to each participant. On completion of the W-GCTA record forms (answer sheet) for both the pre-test and the post-test, the participants were required to use their allocated numbers instead of their names. This ensured that the anonymity of the research participants was maintained. Statistical summaries, covered in chapter 5, pertained to the groups as a whole, and not individual participants.

Honesty with professionalism

No deception of any kind was used in the current study and the researcher reported on the findings of the research study in a truthful way, without misinterpretation or fabrication of information (Graziano and Raulin 2013: 92; Leedy and Ormrod 2014: 110). These research findings will be discussed in chapter 5. Although the students started the integrated assessment in February, data was only collected once ethical clearance was received (Appendix E). The researcher complied with all the requirements laid down by the Institutional Research Ethics Committee (IREC) at the DUT.

4.14 Conclusion

The current chapter focused on the methodology used in the current study. The following aspects of the methodology were explored: research design; target population; data collection instrument; data analysis; ethical considerations; delimitations; limitations as well as the reliability and validity of the study.

The next chapter will focus on the presentation, interpretation and discussion of the research findings.

CHAPTER 5: STATEMENT OF FINDINGS, INTERPRETATION AND DISCUSSION OF THE PRIMARY DATA

5.1 Introduction

The previous chapter provided a synopsis of the methodology used for the current research study. The following aspects of the methodology were explored: research design; target population; data collection instrument; data analysis; ethical considerations; delimitations; limitations; reliability and validity.

This chapter presents the results and discusses the findings obtained from the Watson-Glaser Critical Thinking Appraisal. The W-GCTA was the primary tool that was used to collect data and was distributed to the first-year ECP students at the DUT, registered for the National Diploma: Accounting and the National Diploma: Cost and Management Accounting in 2014. The data collected from their responses was analysed with SPSS version 22.0. These results were presented using descriptive statistics in the form of frequency tables and graphs. Inferential statistics were used to test the hypothesis for the current study. These statistics include the use of correlations as well as regression analysis, which were interpreted using the p-value.

The focus of the current study was on measuring the development of the critical thinking skills of first-year ECP students, using the W-GCTA. Numerous empirical studies have used the W-GCTA to measure the critical thinking skills of students. However, for comparative purposes, the findings of the current study were compared to the Macpherson, Owen and Barnett, Francis studies, discussed in chapter 2. These studies mirrored the current study, as they used the W-GCTA to measure the critical thinking skills of first-year students in a test-retest design. In addition, the results of the current study were also compared to the three norm groups, which had been identified in chapter 4. The main objective (1.6.4) and its five sub-objectives, mentioned in chapter 1, will each be addressed, in the current chapter.

The two most important aspects of precision are reliability and validity. These will be discussed further.

5.2 Validity and Reliability

According to Foxcroft and Roodt (2009: 252), a test measure is only valid for the purpose for which it was designed. The W-GCTA is a standardized critical thinking test. It is a proven instrument for which validity has already been established. The face, content, construct and criterion validity of the instrument was explored in chapter 4. The accuracy and validity of the test, for the current circumstances, was ensured since its content and norms were updated regularly. According to the Watson-Glaser critical thinking appraisal user guide and technical manual (2012: 31), numerous studies, have provided evidence of construct validity for the W-GCTA family of tests. According to Cronbach (1970), as cited by the Watson-Glaser critical thinking appraisal user guide and technical manual (2012: 29), the "Validity is high if a test gives the information the decision maker needs".

The researcher concurred with the aforementioned statement, since the test provided the researcher with diagnostic information pertaining to the gains as well as the areas of deficiency within the students' critical thinking ability. As mentioned in chapter 1, institutions of higher learning were not providing graduates with the critical thinking skills required for the world of work. Consequently, it is the researcher's intention to use the results from the current study to inform teaching, learning and assessment practices at the DUT and other institutions of higher learning.

The reliability of the W-GCTA, measures the consistency of the scoring patterns of the participants (*Watson-Glaser critical thinking appraisal user guide and technical manual* 2012: 22). The researcher used the Guttman Split-Half to establish the Internal Consistency Reliability. The Internal Consistency Reliability determines the degree of consistency between the responses for the individual subtests and the overall score (*Watson-Glaser critical thinking appraisal user guide and technical manual* 2012: 22).

Table 5.1 reflects the Guttman Split-Half Coefficient score for each of the subtests that constituted the W-GCTA. According to the guideline provided by Gupta and Gupta (2011: 66), a reliability coefficient of 0.70 or greater is considered "acceptable".

Table 5.1 Guttman Split-Half Coefficient scores

	Control	Experimental	Combined
Subtest 1:Inferences	0.605	0.274	0.396
Subtest 2:Recognition of assumptions	0.520	0.543	0.580
Subtest 3:Deductions	0.556	0.534	0.802
Subtest 4:Interpretation	0.260	0.483	0.597
Subtest 5:Evaluation of arguments	0.425	0.646	0.775

The combined reliability scores for the subtests ranged between 0.396 and 0.802. The reliability scores for subtests 3 and 5 were high (>0.70), which implied that the responses for these subtests were consistent with the overall test score. These are highlighted in blue. Subtests 1, 2, and 4 had low reliabilities scores indicating that the responses on these tests were not consistent with the overall test score.

It is evident from Table 5.1 that only subtests 3 and 5 had acceptable levels of reliability, while subtests 1, 2 and 4 had reliability values which were lower than the standard. The Barnett and Francis study paralleled the findings of the current study, indicating reliability scores ranging from 0.23 to 0.78 for some of the subtests (Barnett and Francis 2012: 205). Empirical evidence, involving undergraduate and graduate students from 586 universities, also revealed internal consistency scores for the W-GCTA which ranged from 0.24 to 0.62 (Behar-Horenstein and Niu 2011: 27).

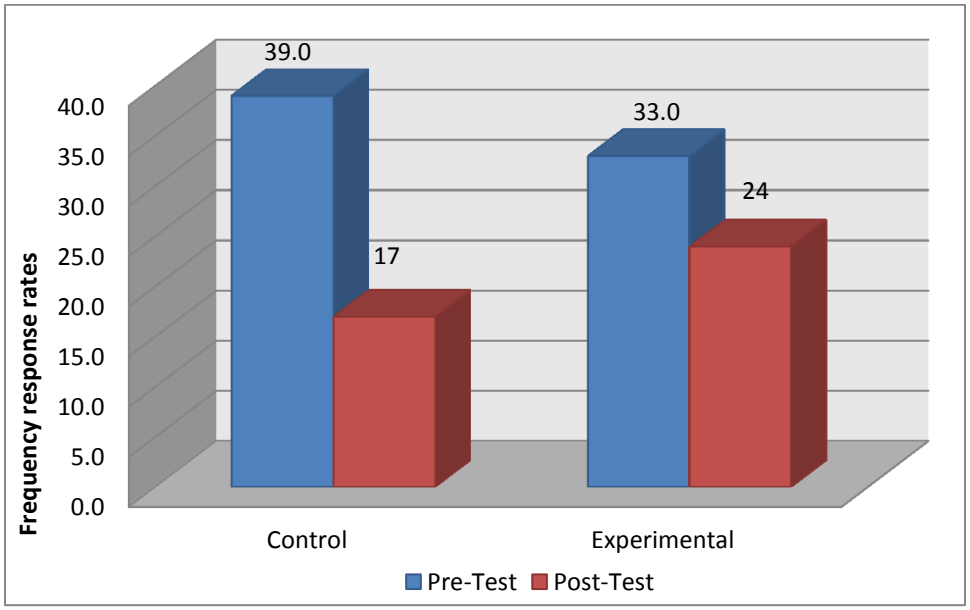
The W-GCTA manual confirmed low reliabilities scores, particularly for groups who have similar abilities (*Watson-Glaser critical thinking appraisal user guide and technical manual* 2012: 23). This is applicable to the current study, since both the control and experimental groups had been identified as having similar abilities, i.e., they had been

identified as being underprepared for higher education due to their educational backgrounds (Department of Higher Education and Training 2012: 1). The W-GCTA manual suggested that low reliability scores (< 0, 70) should only be used for diagnostic purposes and to provide developmental feedback. As mentioned in 5.2 of the current chapter, it is the researcher's intention to use the results of the current study for diagnostic purposes only.

5.3 The sample and response rates

As mentioned in chapter 4, the current study was a census study. Therefore, the sample comprised of all the members within the population. The sample consisted of approximately 80 students, i.e., 40 in both the control and experimental groups. For the pre-test, a total of 39 students participated in the control group and 33 in the experimental group. For the post-test only 17 students participated in the control group and 24 in the experimental group. The frequency response rates are analysed in Figure 5.1 for the pre-and post-tests for both groups.

Figure 5.1 Frequency response rates for the two groupings for the pre-and post-tests



It is evident from Figure 5.1 that there was a high attrition rate between the pre-test and post-test. The percentage response rates for the pre-and post-tests for both groups have been analysed further in Table 5.2.

Table 5.2 Percentage response rates for the groupings for the pre-and post-tests

	Groups		
	Control	Experimental	Total
Pre-Test	97.5%	82.5%	90.0%
Post-Test	42.5%	60.0%	51.3%

Table 5.2 indicates that the initial total response rate for the pre-test was 90%, which was a good response rate. However, this response rate declined to 51.3% in the post-test. The total attrition rate was 38.8%, i.e., 31 out of 80 students dropped out of the study. The attrition rates for the two groupings were as follows:

Control: 22 out of 39 = 56.4%

Experimental Group: 9 out of 33 = 27.3%

It is noteworthy that the drop-out rate for the control group was twice that of the experimental group. The DUT Management Information System revealed the following dropout rates per programme for the first time entering students in 2014:

National Diploma: Accounting (ECP) 26%; and

National Diploma: Cost and Management Accounting (ECP) 30%.

These high dropout rates contributed to the high attrition rates experienced in the current study. Financial constraints and poor academic performance were the main reasons for students dropping out of the respective programmes.

The following factors may have also impacted on the attrition rate:

- Students' reward versus effort

According to Macpherson and Owen (2010: 45), students' efforts were driven by the level of reward. As mentioned in chapter 3, students were driven by marks and would only put in the effort in order to obtain good marks (Crooks 1988, as cited by BoarerPitchford 2010: 27). Students may have experienced low levels of motivation to engage with the W-GTA, as no apparent reward was evident. As mentioned in chapter 4, students were provided with a letter of information, which clearly indicated that their performance in the W-GCTA would have no impact on any of their course marks for any of the subjects/modules for which they were registered. In the researcher's opinion, the students were not willing to put in the necessary effort, particularly in a test which would have no impact on their academic performance in their respective programmes. The researcher also noted that none of the students expressed any interest in knowing what their results were in the pre-test or the post-test.

- Timing of the pre-test and post-test

The pre-test was conducted in the last week of March 2014. This was the students' first term at a tertiary institution, and the first research study in which they had participated. Consequently, according to the researcher, students were more willing to participate in the pre-test. The post-test was conducted in the first week of September 2014. At this stage the students were aware of the requirements of the W-GCTA. The test required hard work on the part of the students, who had to reason their way through various scenarios. As mentioned earlier, students were unwilling to put in the additional effort, for no apparent academic reward. Empirical evidence concurred with the high attrition rate. The Macpherson and Owen study, which used the W-GCTA in a test-retest design, had an attrition rate of 42% between the pre-and post-tests (Macpherson and Owen 2010: 48).

5.4 The Research Instrument

The research instrument consisted of 91 items, with a level of measurement at a nominal or an ordinal level. The test was divided into 6 sections, which measured various themes as illustrated below:

Section A Biographical Data;
Section B Subtest 1 Inferences;
Section C Subtest 2 Recognition of assumptions;
Section D Subtest 3 Deduction;
Section E Subtest 4 Interpretation; and
Section F Subtest 5 Evaluation of arguments.

5.4.1 Analysis of the subtests using descriptive statistics

Descriptive statistics were used to provide an overview of the participants' profile and to ascertain their performance on each of the subtests. The current study used descriptive statistics in the form of frequencies, with percentages and cumulative percentages to analyse the biographical data of both the control and experimental groups. The biographical details of the sample at the start of the study were used. The frequencies for the biographical data have been represented in both tabular and graphical format for certain dimensions of the biographical data. The mean and standard deviation were used to ascertain the overall responses for all the dimensions of the W-GCTA, for both the pre-test and post-test for both groupings. For ease of comparison, the researcher used percentages for the mean scores and the standard deviation. The overall percentage mean scores were obtained by using the raw values.

5.4.1.1 Section A - Biographical data

This section summarises the biographical characteristics of the respondents.

The profile of the sample

The profile of the sample was analysed according to gender, age and racial composition. The gender, age and racial composition of the sample were based on the student intake into the respective programmes for the 2014 academic year.

Gender

The gender profile of the sample is illustrated in Table 5.3.

Table 5.3 The frequency and percentage of the gender groups

			Group		**Total**
			Control	Experimental	
Gender	Male	Count	26	17	43
		% within Group	66.7%	51.5%	59.7%
	Female	Count	13	16	29
		% within Group	33.3%	48.5%	40.3%
Total		Count	39	33	72
		% within Group	100.0%	100.0%	100.0%

The results showed that majority of participants were male (59.7%), followed by females (40.3%). For the control group, the ratio of males to females was 2:1 (66.7%: 33.3%), while the experimental group had a more even composition by gender (51.5%: 48.5%). It was evident from the data that the control group consisted of more males.

Age

The age profile of the sample is illustrated in Table 5.4.

Table 5.4 The frequency and percentage of the age groups

			Group		Total
			Control	Experimental	
Age	16 - 19	Count	23	24	47
		% within Group	59.0%	72.7%	65.3%
	20 - 24	Count	16	9	25
		% within Group	41.0%	27.3%	34.7%
Total		Count	39	33	72
		% within Group	100.0%	100.0%	100.0%

It is evident from the results that the majority of the students were in the 16-19 age group (65.3%), followed by the 20-24 group (34.7%). It was noteworthy that the control group consisted of older students (41%) compared to the experimental group (27.3%). Empirical evidence revealed that the older students performed better in the pre-test than the post-test. Consequently, a further analysis of the pre-test and post-test T scores for both groupings was done based on age, as reflected in Table 5.5.

Table 5.5 Pre-and Post-test T scores based on age

Group	Age		Post-Test T-Score	Pre-Test T-Score
Control	16 - 19	N	10	23
		Mean	26.9000	15.4348
		Std. Deviation	33.71597	27.55297
	20 - 24	N	7	16
		Mean	21.2857	28.8750
		Std. Deviation	25.01143	20.70064
	Total	N	17	39
		Mean	24.5882	20.9487
		Std. Deviation	29.70071	25.56411
Experimental	16 - 19	N	17	24
		Mean	51.5882	38.1667
		Std. Deviation	42.18717	38.20729
	20 - 24	N	7	9
		Mean	37.4286	39.4444
		Std. Deviation	41.91999	35.70053
	Total	N	24	33
		Mean	47.4583	38.5152
		Std. Deviation	41.71016	36.98912
Total	16 - 19	N	27	47
		Mean	42.4444	27.0426
		Std. Deviation	40.45162	34.99873
	20 - 24	N	14	25
		Mean	29.3571	32.6800
		Std. Deviation	34.20438	26.82306
	Total	N	41	72
		Mean	37.9756	29.0000
		Std. Deviation	38.51395	32.31273

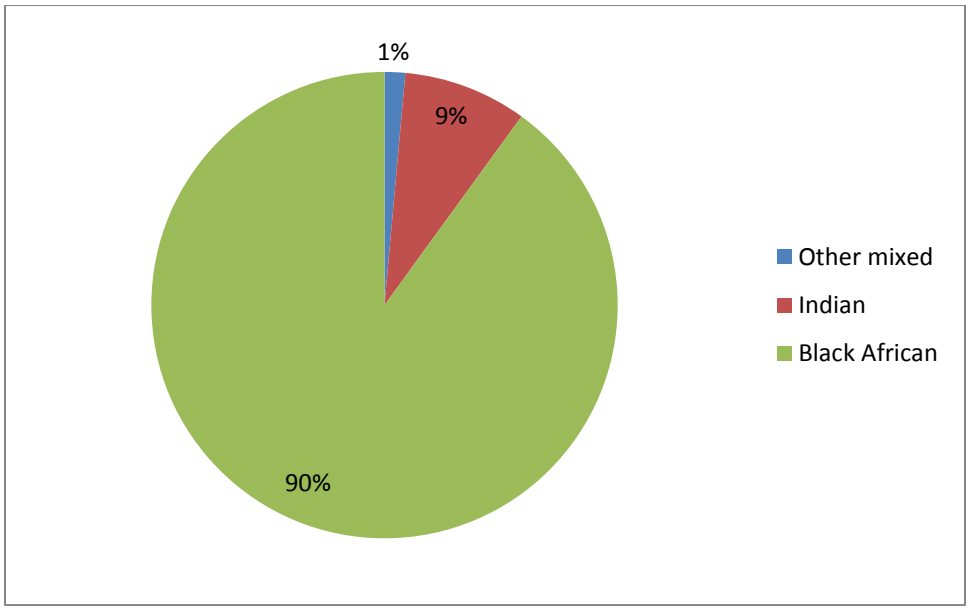
For both groupings, Table 5.5 reveals that the older students in the 20-24 age group obtained higher T-scores in the pre-test as indicated in yellow, compared to their younger counterparts' 16-19 age group, as indicated in blue. It is noteworthy that the post-test T scores of the older students for both groupings declined below the post-test T scores of their younger counterparts. The Macpherson and Owen study concurred

with these findings, indicating a decline in the older students' mean scores from the pre-test to the post-test. The authors suggested that the older students were more likely to consider the effort required against the imminent reward, as opposed to their younger counterparts (Macpherson and Owen 2010).

Race

The racial composition of the sample is illustrated in Figure 5.2.

Figure 5.2 Overall racial composition of the sample



From Figure 5.2, it is evident that the majority of the students were Black African (90%), followed by Indians (8.6%), and Coloureds (Mixed) formed the smallest grouping (1.4%). This is proportional to the existing demographics at the DUT.

In sections B, C, D, E and F that follow, the scoring patterns of the students for each subtest in both the pre-test and the post-test were analysed. The descriptive statistics for these sections addressed the main objective 1.6.4, mentioned in chapter 1, i.e., to investigate whether the integrated assessment conducted with the Extended Curriculum Programme students has improved the critical thinking competencies of these students.

This objective was addressed by sub-objective 1.6.4.1, i.e., to determine the pre-test and post-test critical thinking ability scores of the experimental and control groups, respectively.

As mentioned in chapter 2, critical thinking is one of the most valuable skills that must be imparted to graduates. Consequently, it was the researcher's intention to determine the critical thinking skills that the control and experimental groups possessed at first-year level. It is believed that this should inform teaching, learning and assessment practices in subsequent years.

From the respective sections/subtests, the researcher:

- Ascertained changes, if any, which may have occurred in the control group's critical thinking skills; and
- Determined changes, if any, which may have occurred in the experimental group's critical thinking skills.

The researcher has been cautious in the interpretation of the test results, bearing in mind that these results represented an estimation of the students' actual level of ability. The researcher also took cognisance of the fact that the test had been administered to English second language students, within the South African context.

To reiterate what has been mentioned in section 4.4.2 of chapter 4, the W-GCTA consisted of 80 multiple choice questions, divided into 5 subtests, each consisting of 16 questions. Each of the 16 questions has been based on various scenarios. The details of the individual scenarios will not be mentioned in the analysis of the participants' scoring patterns, as there is a copyright restriction on the test. Each of the scenarios has been analysed in terms of the number of correct responses. It is noteworthy that the researcher did not find any empirical studies, which analysed the 5 subtests, based on

the various scenarios. Consequently, the researcher has done a comparison with other empirical studies based on the overall scores per subtest.

5.4.1.2 Section B – Subtest 1: Inferences

As mentioned in chapter four, this subtest required students to draw the correct conclusions from the factual statements provided. This subtest consisted of 16 questions, which were based on the following three independent scenarios:
Inferences scenario 1: Questions 1 - 6;
Inferences scenario 2: Questions 7 - 11; and
Inferences scenario 3: Questions 12 - 16.

These three independent scenarios were analysed in order to ascertain the existence of possible trends. The mean scores and standard deviations for the pre-test and post-test for the two groups have been provided in Table 5.6. For ease of comparison, these scores have been calculated as percentages of the number of correct responses.

Table 5.6 Mean Scores and Standard Deviations for Subtest 1: Inferences

		Control group				**Experimental group**			
		Pre-test 39		Post-test 17		Pre-test 33		Post-test 24	
Subtest 1: Inferences		Mean %	Std Dev %	Mean %	Std Dev %	Mean %	Std Dev %	Mean %	Std Dev %
	Scenario 1 Q1-6	29	18	38	20	35	15	40	10
	Scenario 2 Q7-11	36	13	29	13	48	8	45	10
	Scenario 3 Q12-16	24	17	16	15	18	14	19	10
	Overall	**29**	16	**29**	18	**34**	17	**35**	15

From Table 5.6, the following patterns are observed with regards to the pre-and post-test performance of the control group. The mean scores of the control group, for the post-test for scenarios 1, 2 and 3 were 38%, 29% and 16%, respectively. The mean scores of the post-test for scenarios 2 and 3 were lower than the mean scores for the pre-test, which were 29%, 36% and 24% for scenarios 1, 2 and 3, respectively. Despite the decrease in the mean scores for scenarios 2 and 3, the overall scoring patterns of the control group in the pre-and post-tests remained fairly consistent at 29%. This was as a result of a 9% increase in the post- test scores for scenario 1.

The researcher expected the post-test scores of the control group to be higher than their pre-test scores. As mentioned in chapter 2, critical thinking is listed as the first Critical Cross Field Outcome, which, in accordance with the National Standards Body requirement, should be embedded within all tertiary qualifications (South African Qualifications Authority 2006: 2). Consequently, students' critical thinking skills should have improved after been exposed to five months of instruction as well as numerous assessments at a tertiary institution. However, the results of the inference subtest were contrary to this expectation. The possible reason for this contradiction is that the teacher-centred approach, which stiffles critical thinking, still dominates classroom and assessment practices at institutions of higher learning (Lombard, K and Grosser 2008: 572-573).

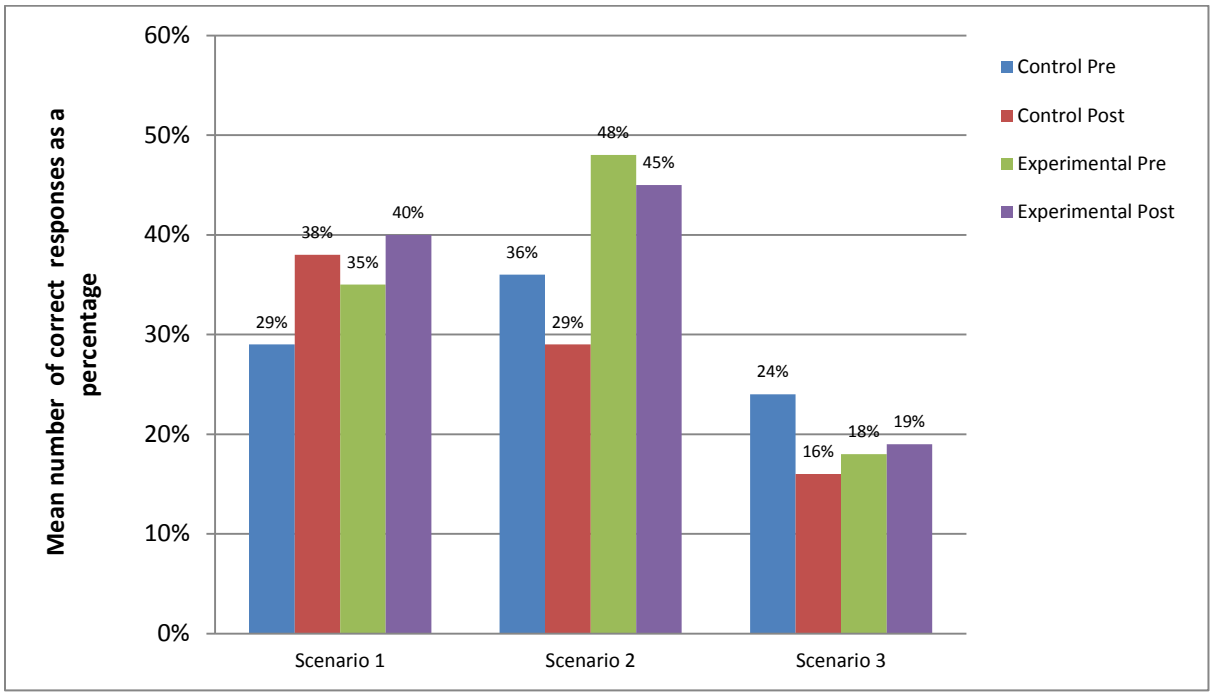
Table 5.6 also reveals the following patterns with regards to the pre-and post-test performance of the experimental group. The mean scores of the experimental group, for the post-test for scenarios 1, 2 and 3, were 40%, 45% and 19%, respectively. The mean scores for scenarios 1 and 3 were higher than the mean scores for the pre-test, which were 35%, 48% and 18%, respectively. The overall scoring patterns of the experimental group increased marginally from 34% in the pre-test to 35% in the post-test. The researcher had two expectations, firstly, that the experimental group's scores in the post-test would be significantly higher than their pre-test scores. Secondly, the

researcher expected that the post-test scores of the experimental group would be higher that the post-test scores of the control group, since the experimental group was exposed to an intevention in the form of an integrated assessment. As mentioned in chapter 3, integrated assessments, as opposed to numerous stand-alone formative assessments, enhance students' critical thinking skills (Boud and Associates 2010).

However, the results of the current study were contrary to the researcher's expectations, with only a small increase from the pre-to the post-test results of the experimental group. The post-test results of the experimental group were, however, higher than the post-test results of the control group. The possible reason for the marginal increase in the post-test score of the experimental group is that critical thinking scores cannot increase dramatically after a single integrated assessment and over the duration of one semester. As mentioned in chapter 2, critical thinking can be acquired over time, with the necessary practice. According to Behar-Horenstein and Niu (2011: 38), it is easier to ascertain changes in critical thinking with longer treatments/interventions. Empirical evidence concurred with this reasoning. As mentioned in chapter 2, the results from the Macpherson and Owen study, which employed the W-GCTA in a test-retest design, indicated that there were no significant gains in the students' critical thinking skills, which remained consistent over the one-year period (Macpherson and Owen 2010: 45). The Drennan study measured the critical thinking ability of graduates who had completed a master's degree in nursing. The results of this study indicated that graduates had statistically higher critical thinking scores than those students who were commencing the programme (Drennan 2010: 422). This reinforces the fact that critical thinking can be developed over a longer period of time.

A graphical representation makes the scoring patterns for both groupings more evident. Figure 5.3 depicts the scoring patterns of the pre-and post-tests for both groupings for subtest 1: Inferences.

Figure 5.3 Scoring patterns of Subtest 1: Inferences



From Figure 5.3, it is evident that scenario 3 was the lowest scoring scenario for both the pre-and post-test for both groupings. None of the groupings achieved more than 24% for this scenario. Scenario 3 contained a lot of information, which may have impacted negatively on the students' ability to make the correct inferences. The highest scoring scenarios were scenario 1 for the control group and scenario 2 for the experimental group. Both groups showed an increase in their scores from the pre-test to the post-test for scenario 1. A possible reason could be that this scenario pertained to a student-teacher relationship which students could identify with. The following trends were evident from Figure 5.3. For scenario 1, both groups' scores increased in the post-test and for scenario 2 both groups' scores decreased in the post-test. Overall, both groups performed poorly in subtest 1: Inferences. However, the experimental group's performance was slightly better with a difference of 5% in the pre-test and 6% in the post-test. The scores for the subtest 1: Inferences were the lowest scores of all 5

subtests. It was evident from the post-test scores that the majority of students, in both the control and experimental groups, could not draw the correct conclusions from the factual statements provided, since the scores recorded for all three scenarios were below 50%. Empirical evidence agreed that subtest 1: Inferences was the lowest scoring subtest of the W-GCTA. According to the study by Macpherson and Owen (2010: 50), the mean scores were similar on all tests except inferences which had the lowest scores for both the pre-and post-tests. These authors suggested that this may be due to the fact that this is the only subtest that has five choice options for the students. The Barnett and Francis study also revealed that inferences had the lowest mean scores when compared to the other subtests for all the groupings concerned (Barnett and Francis 2012: 207).

5.4.1.3 Section C- Subtest 2: Recognition of Assumptions

This subtest required students to detect the implied assumption in given statements. It consisted of 16 questions, which were based on the following 6 independent scenarios:
Recognition of Assumptions scenario 1: Questions 17 - 18;
Recognition of Assumptions scenario 2: Questions 19 - 21;
Recognition of Assumptions scenario 3: Questions 22 - 24;
Recognition of Assumptions scenario 4: Questions 25 - 27;
Recognition of Assumptions scenario 5: Questions 28 - 30; and
Recognition of Assumptions scenario 6: Questions 31 - 32.

The mean scores and standard deviations for each of the aforementioned scenarios for the pre-test and post-test for the two groups have been provided in Table 5.7.

Table 5.7 Mean Scores and Standard Deviations for Subtest 2: Recognition of Assumptions

Subtest 2: Recognition of Assumptions		Control group				Experimental group			
		Pre-test 39		Post-test 17		Pre-test 33		Post-test 24	
		Mean %	Std Dev %	Mean %	Std Dev %	Mean %	Std Dev %	Mean %	Std Dev %
	Scenario 1 Q 17-18	63	45	56	37	67	30	48	38
	Scenario 2 Q 19-21	62	33	65	36	64	18	67	29
	Scenario 3 Q 22-24	48	3	59	0	59	2	47	5
	Scenario 4 Q 25-27	44	20	45	22	51	14	44	17
	Scenario 5 Q 28-30	52	26	61	22	67	21	81	23
	Scenario 6 Q 31-32	40	16	38	12	39	17	38	0
	Overall	**52**	**23**	**55**	**22**	**58**	**17**	**55**	**24**

From Table 5.7, the following patterns were observed. The mean scores for the control group, for the post-test for scenarios 1, 2, 3, 4, 5 and 6 were 56%, 65%, 59%, 45%, 61% and 38%, respectively. The mean scores of four of the six post-test scenarios were higher than the mean scores for the pre-test, which were 63%, 62%, 48%, 44%, 52% and 40% for scenarios 1, 2, 3, 4, 5 and 6, respectively. This resulted in an increase in the overall mean scores of the control group from 52% in the pre-test to 55% in the post-test. These overall scores were consistent with the researcher's expectation that the control groups post-test scores should be higher than their pre-test scores, as mentioned in 5.4.1.2 of the current chapter.

Table 5.7 also revealed the following patterns with regards to the pre-and post-test performance of the experimental group. The mean scores for the experimental group for the post-test for scenarios 1, 2, 3, 4, 5 and 6 were 48%, 67%, 47%, 44%, 81% and 38%, respectively. The mean score for four of the six scenarios were lower than the mean scores for the pre-test, which were 67%, 64%, 59%, 51%, 67% and 39%, respectively. As mentioned earlier in the chapter, the researcher expected the experimental group's performance to increase in the post-test and also expected the post-test results of the experimental group to be substantially higher than the control group's post-test results. The results achieved by the experimental group were contrary to these expectations. The overall scoring patterns of the experimental group decreased from 58%, in the pre-test, to 55% in the post-test. However, despite the decrease in the experimental group's results, the post-test results of the experimental group were consistent with the control group's result of 55%.

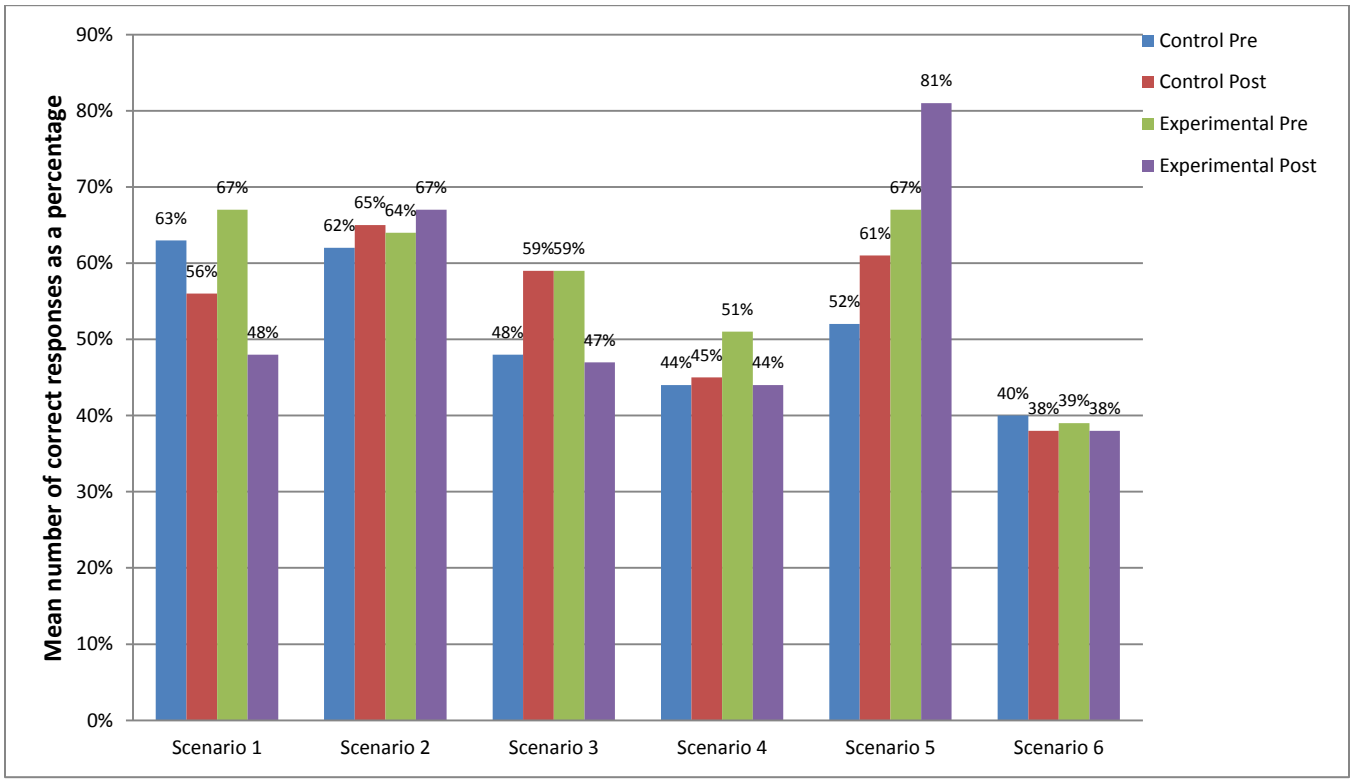
The results of the current study paralled those of Macpherson and Owen (2010: 50), who also indicated a decline in the mean scores from the pre-test to the post-test, for subtest 2. The results of the current study were also comparable to the Barnett and Francis (2012: 207-208) study. In the aforementioned study, all three groupings showed an increase in their subtest 2 scores, from the pre-test to the post-test. Despite the increase in the scores, group B, who had been exposed to higher order thinking questions, had the lowest increase in the mean scores for subtest 2, when compared to the other two groups. The authors affirmed that the students who had completed the higher-order thinking questions did not achieve significantly higher scores on the W-GCTA, when compared to the other two groups. They did, however, perform better in class tests than the other two groups. This was due to the fact that the W-GCTA measured students' general thinking ability. The researcher also investigated the results of the control and experimental groups, for a common first year major subject, i.e., Financial Accounting 1 module 1 and module 2. These results are presented in Table 5.8.

Table 5.8 Financial Accounting 1 (module 1) and (module 2) 2014 examination results per grouping

	Control group % pass on wrote	Experimental group % pass on wrote
Financial Accounting 1 (module 1)	80	97
Financial Accounting 1 (module 2)	84	97

Table 5.8 indicated that the experimental group outperformed the control group in the Financial Accounting 1 (module 1and module 2) semester examinations. These findings concur with the Barnett and Francis study (2012: 207-208) in which the students, who were exposed to the higher-order thinking questions, outperforemed the other groups, in the class tests. The trends associated with the various scenarios of subtest 2, for the pre-and post-tests for both groupings, are depicted in Figure 5.4.

Figure 5.4 Scoring patterns of Subtest 2: Recognition of Assumptions



From Figure 5.4, it is evident that scenario 6 was the lowest scoring scenario for both the pre-and post-tests for both groupings, with 40% being the highest score achieved for this scenario. It is also evident from Figure 5.4 that both groups' results decreased in the post-test for scenario 6. This indicates that the students struggled to detect the implied assumptions from the statements provided in scenario 6. The highest scoring scenario was scenario 2 for the control group and scenario 5 for the experimental group. Figure 5.4 reveals consistent scoring patterns in four of the scenarios, for both the control and experimental groups, i.e., for scenario 1 and 6, both groups' scores decreased in the post-test and, for scenario 2 and 5, both groups' scores increased in the post-test. These consistent scoring patterns resulted in an overall score of 55% for both groups, in the post-test. The scores for the subtest 2 were the highest scores obtained by both groups across all 5 subtests. It is evident from the post-test scores that more than half of the students could detect the implied assumption in the given statements.

5.4.1.4 Section D - Subtest 3: Deduction

This section determined whether the proposed conclusions, drawn by the students, followed rationally from the information provided. It consisted of the following 16 questions, which were based on 5 independent scenarios:

Deduction scenario 1: Questions 33 - 35;
Deduction scenario 2: Questions 36 - 38;
Deduction scenario 3: Questions 39 - 41;
Deduction scenario 4: Questions 42 - 44; and
Deduction scenario 5: Questions 45 - 48

The mean scores and standard deviations for each of the above scenarios for the pre-test and post-test for the two groups have been provided in Table 5.9.

Table 5.9 Mean Scores and Standard Deviations for Subtest 3: Deduction

		Control group				Experimental group			
		Pre-test 39		Post-test 17		Pre-test 33		Post-test 24	
		Mean %	Std Dev %	Mean %	Std Dev %	Mean %	Std Dev %	Mean %	Std Dev %
Subtest 3: Deduction	Scenario 1 Q 33-35	66	23	78	15	63	6	69	13
	Scenario 2 Q 36-38	42	24	49	29	52	21	46	29
	Scenario 3 Q 39-41	59	9	55	9	49	11	46	11
	Scenario 4 Q 42-44	42	10	43	3	40	9	53	13
	Scenario 5 Q 45-48	47	12	44	16	33	12	53	21
	Overall	**51**	**17**	**53**	**19**	**46**	**15**	**53**	**18**

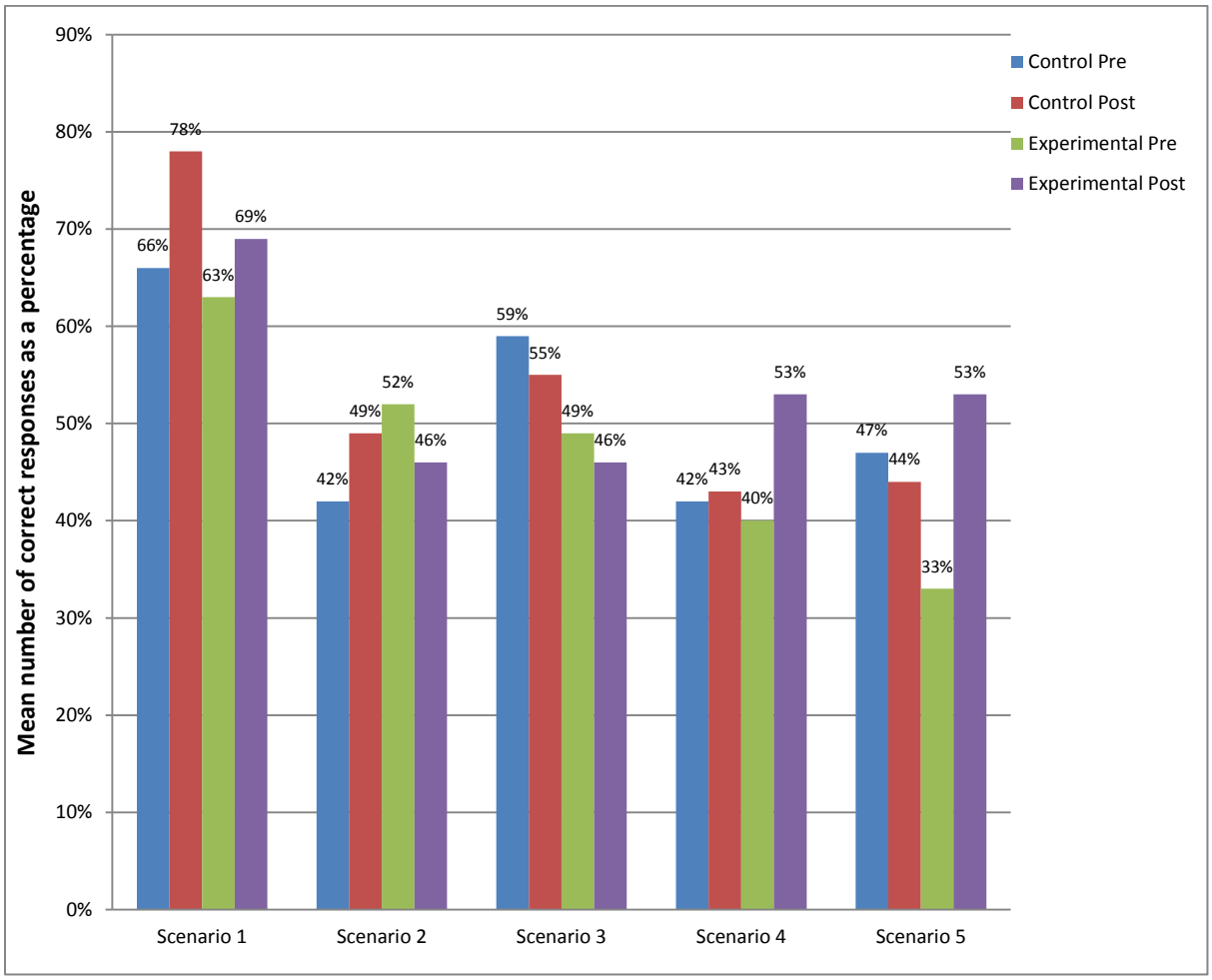
From Table 5.9, the following patterns were observed. The mean scores for the control group for the post-test for scenarios 1, 2, 3, 4 and 5 were 78%, 49%, 55%, 43% and 44%, respectively. The mean scores of three of the five post-test scenarios were higher than the mean scores for the pre-test, which were 66%, 42%, 59%, 42% and 47% for scenarios 1, 2, 3, 4 and 5, respectively. This resulted in an increase in the overall mean scores of the control group from 51% in the pre-test to 53% in the post-test. These overall scores were consistent with the researcher's expectation, as mentioned earlier in the chapter.

Table 5.9 also revealed the following patterns with regards to the pre-and post-test performance of the experimental group. The mean scores for the experimental group for the post-test for scenarios 1, 2, 3, 4 and 5 were 69%, 46%, 46%, 53% and 53%, respectively. Similarly, like the control group, the mean scores for three of the five scenarios were higher than the mean scores for the pre-test, which were 63%, 52%,

49%, 40% and 33%, respectively. The experimental group's overall results increased from 46% in the pre-test to 53% in the post-test, which is in line with the researcher's expectation that the post-test mean scores of the experimental group should be higher than their pre-test scores. However, the overall post-test results were not substantially higher than the control group's overall post-test result of 53%, which is contrary to the researcher's expectation. It is noteworthy that the both groups' results increased in the post-test. However, the experimental group achieved a larger increase in their overall post-test results, i.e., 7% as opposed to the control group's 2% increase.

The results of the current study are similar to that of Barnett and Francis (2012: 207), which also indicated a increase in the mean scores from the pre-test to the post-test for two of the three groups for subtest 3. Group B, i.e., those students who had been exposed to higher-order thinking questions had the largest increase in their post-test mean scores when compared to the other two groups. This result is in line with the results of the current study, where the experimental group achieved a larger increase in their overall post-test results. The trends related to the various scenarios of subtest 3 for the pre-and post-tests for both groupings are depicted in Figure 5.5.

Figure 5.5 Scoring patterns for Subtest 3: Deduction



From Figure 5.5, it is evident that scenario 1 was the highest scoring scenario for both the pre-and post-test for both groupings, with 78% being the highest score recorded for this scenario. None of the post-test results for both groups fell below the 40% mark. Figure 5.5 revealed consistent scoring patterns in three of the five scenarios, for both the control and experimental groups, i.e., for scenarios 1 and 4, both groups' scores increased in the post-test and, for scenario 3, both groups' scores decreased in the post-test. These consistent scoring patterns resulted in an overall score of 53% for both groups, in the post-test. It is evident from the post-test scores reflected in figure 5.5 that more than half of the students could determine whether the proposed conclusions drawn followed rationally from the information provided.

5.4.1.5 Section E - Subtest 4: Interpretation

This section ascertained whether students could judge, based on the information provided, if the proposed conclusions drawn were merited. It consisted of the following 16 questions, which were based on 6 independent scenarios:

Interpretation scenario 1: Questions 49 - 51;

Interpretation scenario 2: Questions 52 - 54;

Interpretation scenario 3: Questions 55 - 56;

Interpretation scenario 4: Questions 57 - 59;

Interpretation scenario 5: Questions 60 - 61; and

Interpretation scenario 6: Questions 62 - 64

The mean scores and standard deviations for each of the above scenarios for the pre-test and post-test for the two groups are provided in Table 5.10.

Table 5.10 Mean Scores and Standard Deviations for Subtest 4: Interpretation

		Control group				**Experimental group**			
		Pre-test 39		Post-test 17		Pre-test 33		Post-test 24	
		Mean %	Std Dev %	Mean %	Std Dev %	Mean %	Std Dev %	Mean %	Std Dev %
Subtest 4: Interpretation	Scenario 1 Q 49- 51	43	25	55	24	49	21	49	23
	Scenario 2 Q 52-54	66	12	57	15	52	10	58	7
	Scenario 3 Q 55-56	45	13	59	33	52	0	52	3
	Scenario 4 Q 57-59	49	7	53	12	38	15	50	25
	Scenario 5 Q 60-61	51	44	50	37	44	19	58	41
	Scenario 6 Q 62-64	29	15	22	18	21	17	29	11
	Overall	**47**	**21**	**49**	**23**	**42**	**17**	**49**	**20**

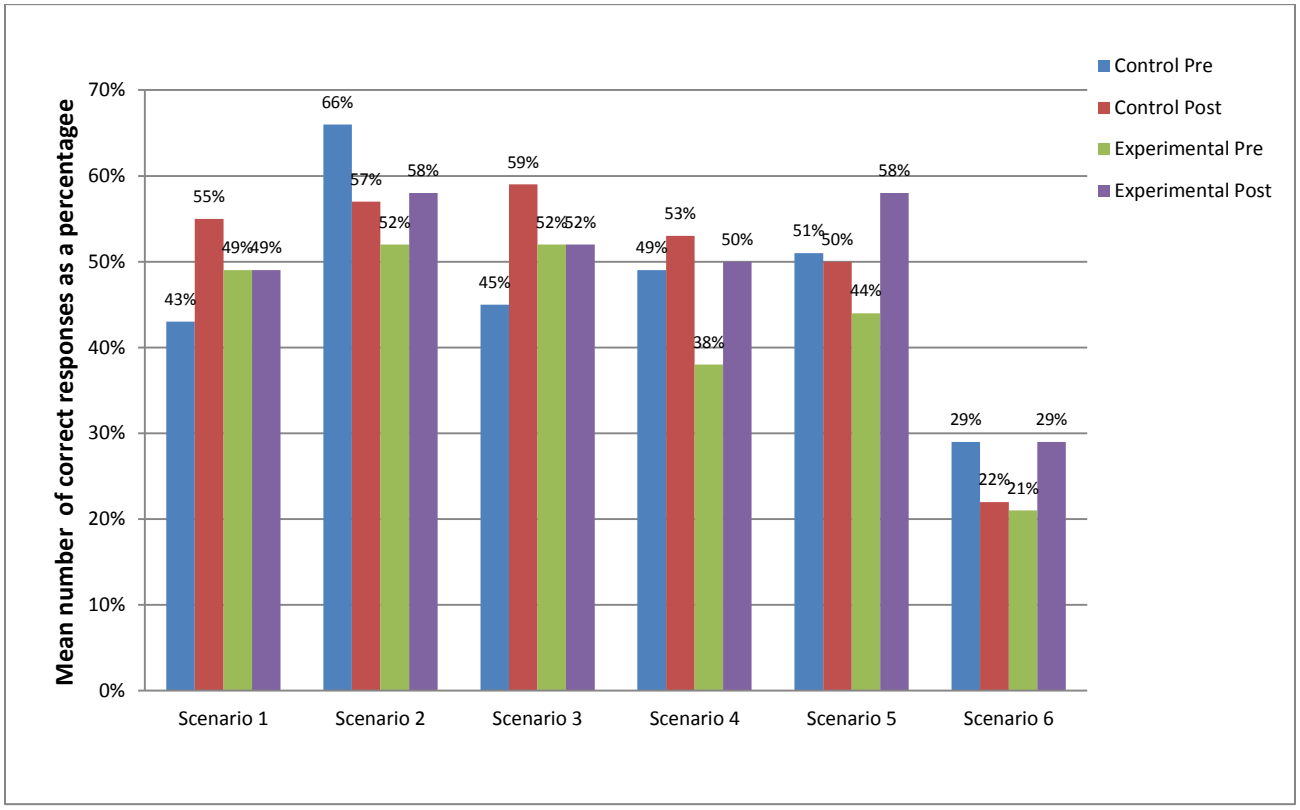
From Table 5.10, the following patterns were observed. The mean scores for the control group for the post-test for scenarios 1, 2, 3, 4, 5 and 6 were 55%, 57%, 59%, 53%, 50% and 22%, respectively. The increase and decrease in the mean scores of the post-test scenarios were split evenly between the six scenarios with three scenarios showings and increase in the post-test mean scores and three scenarios reflecting a decrease in the post-test mean scores. The mean scores for the pre-test for scenarios 1, 2, 3, 4, 5 and 6 were 43%, 66%, 45%, 49%, 51% and 29%, respectively. The overall mean scores of the control group increased marginally from 47% in the pre-test to 49% in the post-test. These overall scores were aligned with the researcher's expectation that the post-test scores of the control group would be higher than their pre-test scores.

Table 5.10 also revealed the following patterns with regards to the pre-test and post-test performance of the experimental group. The mean scores for the experimental group for the post-test for scenarios 1, 2, 3, 4, 5 and 6 were 49%, 58%, 52%, 50%, 58% and 29%, respectively. The mean score for all six scenarios were higher than the mean scores for the pre-test, which were 49%, 52%, 52%, 38%, 44% and 21%, respectively. The overall mean scores of the experimental group increased from 42% in the pre-test to 49% in the post-test. This was in line with the researcher's expectation that the post-test scores of the experimental group would be higher than their pre-test scores. However, despite the increase in all six scenarios of the subtest, the experimental groups' overall performance, as reflected in Table 5.10, was still on par with the control group, with each group achieving an overall post-test mean score of 49%. This was contrary to the researcher's second expectation, as mentioned earlier in the chapter.

The results of the current study paralleled that of Macpherson and Owen (2010: 50), which indicated an increase in the mean scores from the pre-test to the post-test for subtest 4. However, the Barnett and Francis (2012: 207) study revealed that only group B, i.e., those students who were exposed to the higher-order questions, exhibited an increase in their post-test mean scores for subtest 4. This is reflective of the

experimental group of the current study who achieved an increase in each of the six scenarios associated with interpretation. The trends associated with the various scenarios of subtest 4 for the pre-and post-tests for both groupings are depicted in Figure 5.6.

Figure 5.6 Scoring patterns for Subtest 4: Interpretation



From Figure 5.6, it is evident that scenario 6 was the lowest scoring scenario for both the pre-test and the post-test for both groupings, with 29% being the highest score recorded for this scenario. This indicates that the students could not judge, based on the information provided, if the proposed conclusions drawn from the statements provided in scenario 6 were merited or not. Figure 5.6 revealed a consistent scoring pattern in only one of the six scenarios, for both the control and experimental groups, i.e., for scenario 4, both groups' scores increased in the post-test. Despite the

inconsistent scoring patterns for this subtest, the overall post-test scores for both groups was 49%. It is evident from the post-test scores reflected in Figure 5.6 that almost half of the students could determine whether the proposed conclusions drawn followed rationally from the information provided.

5.4.1.6 Section F – Subtest 5: Evaluation of Arguments

This section dealt with the students' ability to evaluate the strength and applicability of the proposed arguments. It consisted of the following 16 questions, which were based on 5 independent scenarios:

Evaluation of Arguments scenario 1: Questions 65 - 67;
Evaluation of Arguments scenario 2: Questions 68 - 70;
Evaluation of Arguments scenario 3: Questions 71 - 73;
Evaluation of Arguments scenario 4: Questions 74 - 76; and
Evaluation of Arguments scenario 5: Questions 77 - 80.

The mean scores and standard deviations for each of the above scenarios for the pre-test and post-test for the two groups have been provided in Table 5.11.

Table 5.11 Mean Scores and Standard Deviations for Subtest 5: Evaluation of Arguments

Subtest 5: Evaluation of Arguments		Control group				Experimental group			
		Pre-test 39		Post-test 17		Pre-test 33		Post-test 24	
		Mean %	Std Dev %	Mean %	Std Dev %	Mean %	Std Dev %	Mean %	Std Dev %
	Scenario 1 Q 65-67	48	10	47	21	37	16	57	15
	Scenario 2 Q 68-70	40	12	53	20	35	6	58	11
	Scenario 3 Q 71-73	36	17	53	26	24	8	53	17
	Scenario 4 Q 74-76	53	10	50	24	34	6	56	2
	Scenario 5 Q 77-80	46	12	57	22	33	5	59	16
	Overall	**45**	**12**	**53**	**20**	**33**	**9**	**57**	**12**

From Table 5.11, the following trends were observed. The mean scores for the control group for the post-test for scenarios 1, 2, 3, 4 and 5 were 47%, 53%, 53%, 50% and 57%, respectively. Of the five scenarios, three scenarios showed an increase in the post-test mean scores, while two scenarios reflected a decrease in the post-test mean scores. The mean scores for the pre-test for scenarios 1, 2, 3, 4 and 5 were 48%, 40%, 36%, 53% and 46%, respectively. The overall mean scores of the control group increased by 8% from 45% in the pre-test to 53% in the post-test. This 8% increase was the largest increase that the control group achieved in the post-test across all five subtests. These overall scores concurred with the researcher's expectation, as mentioned earlier in the chapter.

Table 5.11 revealed the following patterns with regards to the pre-test and post-test performance of the experimental group. The mean scores for the experimental group for the post-test for scenarios 1, 2, 3, 4 and 5 were 57%, 58%, 53%, 56% and 59%, respectively. The post-test mean scores for all five scenarios were higher than the pre-test mean scores, which were 37%, 35%, 24%, 34% and 33%, respectively. The overall means scores of the experimental group increased by 24% from 33% in the pre-test to 57% in the post-test. This was the highest increase that the experimental group achieved in the post-test across all five subtests. These results were in line with the researcher's expectation that the post-test scores of the experimental group would be higher than their pre-test scores. These results were also higher than the control group's overall post-test mean score of 53%, which is in line with the researcher's second expectation, i.e., the post-test scores of the experimental group should be higher than the post-test scores of the control group. This may be attributable to the integrated assessment, which required the experimental group to draw conclusions and provide recommendations.

It is noteworthy that the results of the current study were contrary to the studies of the Macpherson and Owen and Barnett and Francis. Both these studies indicated a decrease in the mean scores from the pre-test to the post-test for subtest 5 (Macpherson and Owen 2010: 50; Barnett and Francis 2012: 207). However, despite the decrease, the Barnett and Francis study revealed that group B, i.e., those students who were exposed to the higher order thinking questions had the highest post-test mean scores for subtest 5, when compared to the other two groups (Barnett and Francis 2012: 207). For the current study, the experimental group's overall post-test mean scores were higher than the control group's overall post-test mean scores for subtest 5.

The trends associated with the various scenarios of subtest 5, for the pre-and post-tests, for both groupings are depicted in Figure 5.7.

Figure 5.7 Scoring patterns for Subtest 5: Evaluation of Arguments

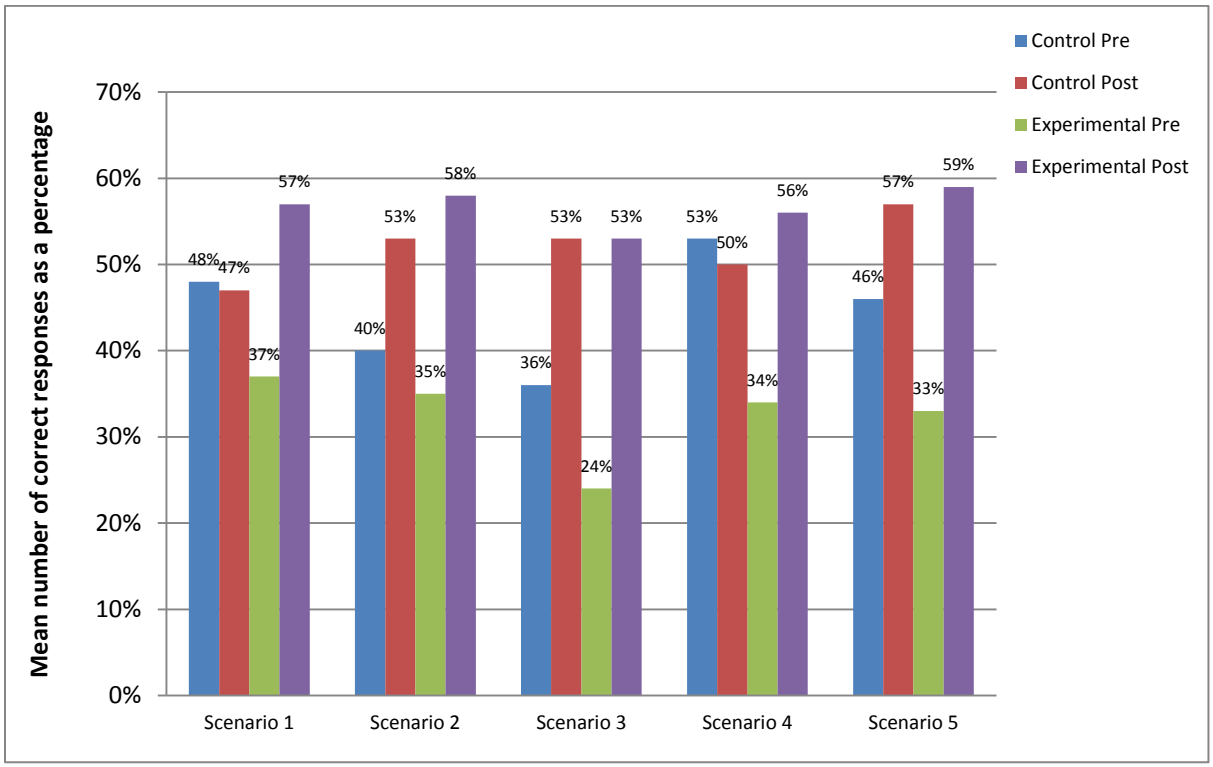


Figure 5.7 revealed consistent scoring patterns in three of the scenarios, for both the control and experimental groups, i.e., for scenarios 2, 3 and 5, both groups' scores increased in the post-test. Despite the increase in the scores for scenarios 2, 3 and 5 for both groupings, it is noteworthy that the experimental group achieved a more sizable increase in their post-test scores. It is evident from Figure 5.7 that the experimental group outperformed the control group in four of the five scenarios. The experimental group's scores in the pre-test ranged from 24% to 37%, and their post-test scores ranged from 53 to 59%.

According to Figure 5.7, based on the post-test scores, more than half of the students could evaluate the strength and applicability of the proposed arguments. The experimental group, however, showed more substantial gains in their ability to evaluate arguments as opposed to the control group.

5.4.1.7 Summary of subtest results

The overall means scores of the pre-and post-tests, for each subtest, for both the control and experimental groups, have been summarised in Table 5.12.

Table 5.12 Summary of subtest results for both groupings

	Control group				**Experimental group**			
	Pre-test 39		Post-test 17		Pre-test 33		Post-test 24	
	Mean %	Std Dev %	Mean %	Std Dev %	Mean %	Std Dev %	Mean %	Std Dev %
Subtest 1: Inferences	29	16	29	18	34	17	35	15
Subtest 2: Recognition of Assumptions	52	23	55	22	58	17	55	24
Subtest 3: Deductions	51	16	53	19	46	15	53	18
Subtest 4: Interpretation	47	21	49	23	42	17	49	20
Subtest 5: Evaluation of Arguments	45	12	53	20	33	9	57	12
Overall	**45**	**19**	**48**	**22**	**43**	**18**	**50**	**19**

From Table 5.12, the following patterns were observed. The mean scores for the control group, for the post-test for subtests 1, 2, 3, 4 and 5 were 29%, 55%, 53%, 49% and 53%, respectively. Table 5.12 revealed that four of the 5 subtests showed an increase in the post-test mean scores, while one subtest score remained consistent at 29% from pre- to post-test. The mean scores for the pre-test for subtests 1, 2, 3, 4 and 5 were 29%, 52%, 51%, 47% and 45%, respectively. The overall means scores of the control group increased marginally by 3% from 45% in the pre-test to 48% in the post-test. These overall scores concurred with the researcher's expectation that the control group's results should be higher in the post-test.

Table 5.12 also revealed the following patterns with regards to the pre-test and post-test performance of the experimental group. The mean scores for the experimental group for the post-test for subtests 1, 2, 3, 4 and 5 were 35%, 55%, 53%, 49% and 57%, respectively. The mean scores of four of the subtests were higher than the mean scores for the pre-test, with one subtest showing a decline in the post-test mean score. The mean scores for the pre-test were 34%, 58%, 46%, 42% and 33%, respectively. The overall means scores of the experimental group increased by 7%, i.e., from 43% in the pre-test to 50% in the post-test. These overall results were in line with the researcher's expectations. The post-test scores of the experimental group were higher than their pre-test scores and the post-test scores of the experimental group were also higher than the post-test scores of the control group.

It is noteworthy that the control group's overall results increased by 3% from pre-to post-test, while the experimental group achieved a larger increase of 7% from pre-to post-test. These results are similar to those of Barnett and Francis where all three groups achieved a modest increase in their overall mean scores from the pre-to the post-test. However, the students who were exposed to the higher-order thinking questions achieved the largest increase in their pre-to post-test results (Barnett and Francis 2012: 207).

The trends associated with the 5 subtests, for the pre-and post-tests for both groupings are depicted in Figure 5.8.

Figure 5.8 Summary of the subtest results

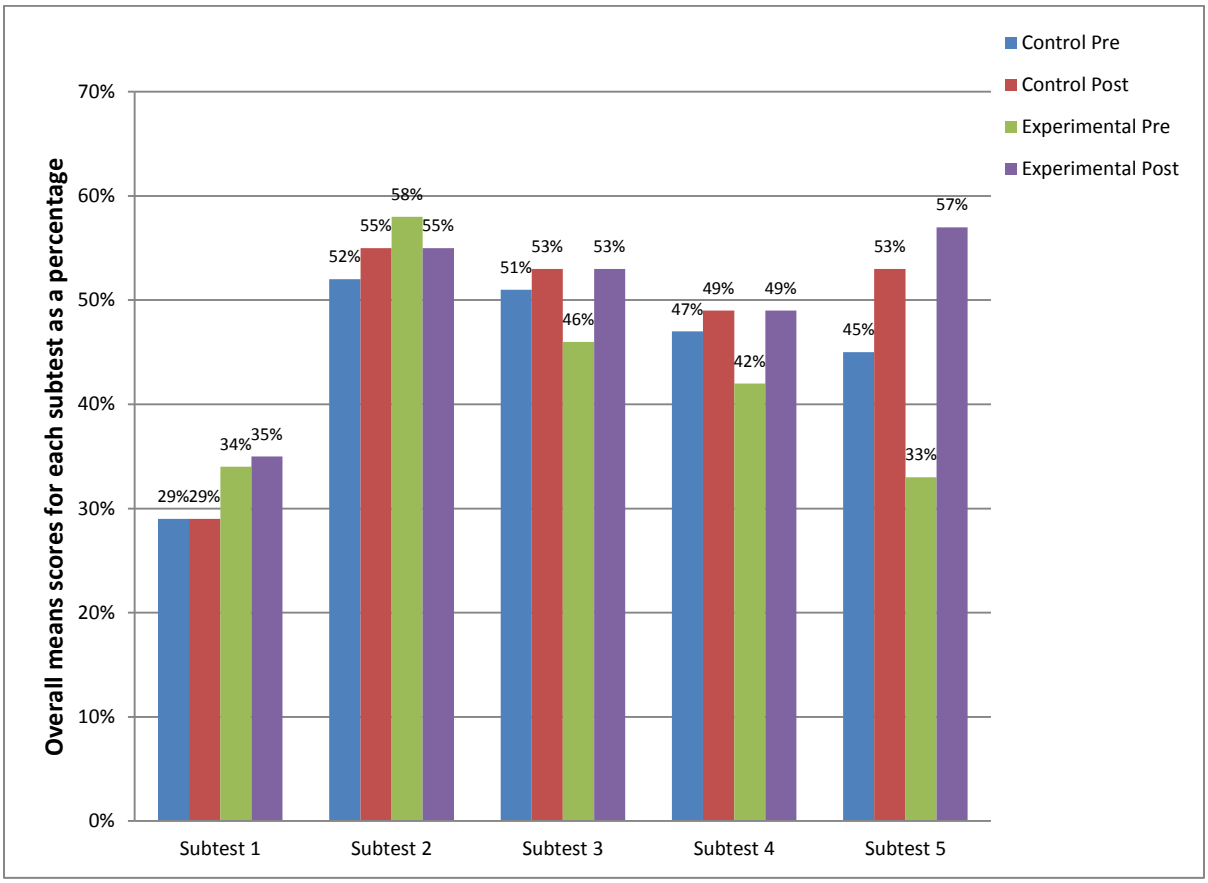


Figure 5.8 indicates consistent scoring patterns in the post-test scores, for both the control and experimental groups, for subtest 2: Recognition of Assumptions (55%); subtest 3: Deduction (53%) and subtest 4: Interpretation (49%). The highest scoring subtest for both groupings was subtest 2: Recognition of Assumptions, with scores ranging from 52% to 58%. However, subtest 1: Inferences was the lowest scoring subtest for both groupings, with scores ranging from 29% to 35%. Empirical evidence concurred with these findings indicating that the mean scores for the various subtests were similar, with the exception of subtest 1(Inferences) which had the lowest mean scores when compared to the other four subtests (Lombard, K and Grosser 2008: 570; Macpherson and Owen 2010: 50; Barnett and Francis 2012: 207). It is noteworthy that the summary of the subtest results, reflected in Table 5.12 and Figure 5.8, identified the areas of deficiency within students' critical thinking skills, which would require developmental work in the form of appropriate instruction and assessments. From the

summary of the subtest results, it is evident that the descriptive statistics addressed objective 1.6.4, based on sub objective 1.6.4.1. In addition to the descriptive statistics, inferential statistics were also used to address the main objective (1.6.4).

5.4.2 Analysis of the subtest results using inferential statistics

As mentioned in chapter 1, the main objective (1.6.4) investigates whether the integrated assessment conducted with the Extended Curriculum Programme students has improved the critical thinking competencies of these students. Inferential statistics were used to address the aforementioned main objective, through the five sub-objectives which were related to the hypotheses of the current study. To determine whether the means were significantly different, the Mann-Whitney *U* test was done within and between groups, using the p value at 95% level of confidence ($p < 0.05$). According to Black (2011: 819), the Mann-Whitney *U* test is used to compare the means of two populations that are independent. The control and the experimental groups of the current study were independent of each other. The researcher could not use the Wilcoxon Signed Rank test for the comparison within the experimental and control groups, due to the high attrition rate, which made it difficult to match the respondents from the pre-test to the post-test.

Sub-objective 1.6.4.2 is to assess whether there is a statistically significant difference in the pre-test critical thinking ability scores of the experimental and control groups. The results of the Mann-Whitney *U* test are shown in Table 5.13.

Table 5.13 Mann-Whitney *U* test – Overall pre-test scores by control and experimental groups

	Number Correct
Mann-Whitney U	2350.000
Z	-2.904
Asymp. Sig. (2-tailed) / p-value	.004

The results in Table 5.13 show a statistically significant difference in the overall pre-test critical thinking scores of the control and experimental groups (Mann- Whitney U = 2350.00; Z = - 2.904, $p < 0.05$). The p-value, highlighted in yellow, indicated a high significance level at the 99% level of confidence ($p = 0.004$). Therefore, according to these results, there is a statistically significant difference in the pre-test critical thinking ability scores of the experimental and control groups. Consequently, the alternate hypothesis Ha_1, i.e., there is a statistically significant difference in the pre-test critical thinking ability scores of the experimental and control groups, can be accepted and the null hypothesis Ho_1 can be rejected.

The statistical significance in the overall pre-test scores suggested change in favour of the control group. This result concurs with Table 5.12 (summary of the subtest results), which indicated that the overall pre-test scores of the control group were higher than the overall pre-test scores of the experimental group. The researcher did not expect to find a significant difference between the pre-test scores of the groups, since it was believed that the groups were similar, since both groups had been identified as being underprepared for higher education due to their educational backgrounds (Department of Higher Education and Training 2012: 1).

Sub-objective 1.6.4.3 is to ascertain whether there is a statistically significant difference between the pre-test and post-test critical thinking ability scores of the experimental and control groups, respectively. The results of the Mann-Whitney *U* test for the control group and the experimental group are shown in Tables 5.14 and 5.15, respectively.

Table 5.14 Mann-Whitney *U* test – Control group overall pre-test and post-test scores

	Control group Number Correct
Mann-Whitney U	870.000
Z	-7.962
Asymp. Sig. (2-tailed) / p-value	.000

Table 5.15 Mann-Whitney *U* test – Experimental group overall pre-test and post-test scores

	Experimental group Number Correct
Mann-Whitney U	2484.500
Z	-2.446
Asymp. Sig. (2-tailed) / p-value	.014

The results in Table 5.14 show a statistically significant difference in the overall pre-test and post-test critical thinking scores of the control group (Mann- Whitney U = 870.00; Z = - 7.962, $p < 0.05$). The results in Table 5.15 also show a statistically significant difference in the overall pre-test and post-test critical thinking scores of the experimental group (Mann- Whitney U = 2484.50; Z = - 2.446, $p < 0.05$). The p-values, highlighted in yellow indicated a high level of significance for both groupings at the 99% level of confidence, i.e., $p = 0.000$ and $p = 0.014$ for the control and experimental groups, respectively. The results revealed that there is a statistically significant difference in the pre-test and post-test critical thinking ability scores of the control and experimental groups. Consequently, the alternate hypothesis Ha_2, i.e., there is a statistically significant difference in the pre-test and post-test critical thinking ability scores of the experimental and control groups, respectively, can be accepted and the null hypothesis Ho_2 can be rejected.

The statistical significance in the overall pre-test scores and post-test scores of both groupings concur with the scores provided in Table 5.12 (summary of the subtest results), where both groups' scores increased in the post-test. The researcher expected to find a significant difference between the pre-test scores and post-test scores in favour of the post-test. As mentioned earlier in the chapter, students' critical thinking skills should have improved after spending five months at a tertiary institution. The Barnett and Francis study also showed a significant improvement in the post-test results over one semester at the 99% level of confidence ($p = 0.005$) (Barnett and Francis 2012: 206).

Sub-objective 1.6.4.4 is to determine whether there is a statistically significant difference in the post-test critical thinking ability scores between the experimental and control groups. The results of the Mann-Whitney *U* test are shown in Table 5.16.

Table 5.16 Mann-Whitney *U* test – Overall post-test scores by control and experimental groups

	Number Correct
Mann-Whitney U	1714.500
Z	-5.083
Asymp. Sig. (2-tailed) / p- value	.000

The results in Table 5.16 showed a statistically significant difference in the overall post-test critical thinking scores of the control and experimental groups (Mann- Whitney U = 1714.50; Z = - 5.083, $p < 0.05$). The p-value, highlighted in yellow, indicated a high significance level at the 99% level of confidence ($p = 0.000$). Therefore, these results indicated that there is a statistically significant difference in the post-test critical thinking ability scores of the experimental and control groups. Consequently, the alternate hypothesis Ha_3, i.e., there is a statistically significant difference in the post-test critical thinking ability scores of the experimental and control groups, can be accepted and the null hypothesis Ho_3 can be rejected.

The statistical significance in the overall post-test scores suggested that there is a change in favour of the experimental group. This suggestion concurs with Table 5.12 (summary of subtest results), which indicated that the overall post-test scores of the experimental group were significantly higher than the overall post-test scores of the control group. The researcher expected to find a significant difference between the post-test scores of the groupings. The experimental group, as mentioned earlier in the chapter, was exposed to an integrated assessment, which, according to the literature reviewed in chapter 3, should have enhanced the group's critical thinking skills. The

researcher, therefore, believed that the integrated assessment could have influenced the experimental group's increased post-test scores. However, this change cannot be attributed to the integrated assessment alone, as other factors could have also impacted on the experimental group's overall post-test scores. As highlighted by Barnett and Francis (2012: 208), accumulative activities across the curriculum can cause an increase in critical thinking skills.

5.4.2.1 Correlations

As mentioned in chapter 4, correlations were used to determine whether two or more variables were associated with one another in some way. Since the total of the number correct was used, the data was treated as numerical/ scale variable. Hence the Pearson correlation was used. The following correlations were done for the experimental group using Pearson correlation: a correlation between the various subtests; and an overall correlation between the pre-test and post-test T scores. Positive numbers indicated a positive correlation and negative numbers indicated a negative correlation. A positive correlation reflected a direct relationship, while a negative correlation reflected an indirect relationship. The results of the Pearson correlation between the subtests are provided in Table 5.17.

Table 5.17 Correlations between subtest scores

		Inferences Post_Total	Recognition Post_Total	Deduction Post_Total	Interpretation Post_Total	Evaluation Post_Total
Inferences Post_Total	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	24				
Recognition Post_Total	Pearson Correlation	.504*	1			
	Sig. (2-tailed)	.012				
	N	24	24			
Deduction Post_Total	Pearson Correlation	.469*	.351	1		
	Sig. (2-tailed)	.021	.093			
	N	24	24	24		
Interpretation Post_Total	Pearson Correlation	.230	.293	.154	1	
	Sig. (2-tailed)	.280	.164	.472		
	N	24	24	24	24	
Evaluation Post_Total	Pearson Correlation	.572**	.352	.555**	.022	1
	Sig. (2-tailed)	.003	.092	.005	.920	
	N	24	24	24	24	24

All values with a * or **, indicated a significant relationship. A (*) indicated that the correlation is significant at the 0.05 level (2-tailed) and (**) indicated that the correlation is significant at the 0.01 level (2-tailed). The results in Table 5.17 revealed a strong correlation between subtest 5 (Evaluation of Arguments); subtest 1 (Inferences), and subtest 3 (Deduction) at the 99% level of confidence. Further, there is also a significant correlation between subtest 1(Inferences); subtest 2 (Recognition of Assumptions) and subtest 3 (Deduction), at the 95% level of confidence. The results of the correlation between the overall pre-test and post-test T scores are provided in Table 5.18.

Table 5.18 Overall correlations between pre-and post-test T scores: Experimental group

		Pre-Test T-Score	Post-Test T-Score
Pre-Test T-Score	Pearson Correlation	1	.475*
	Sig. (2-tailed)		.019
	N	33	24
Post-Test T-Score	Pearson Correlation	.475*	1
	Sig. (2-tailed)	.019	
	N	24	24

From Table 5.18, it is noted that there is a significant correlation between the pre-and post-test T scores (r = 0.475). Since the relationship is positive, it implies that an increase in one variable resulted in an increase in the other, and vice versa.

5.4.2.2 Regression results

Regression analysis was conducted to address sub-objective 1.6.4.5. Sub-objective 1.6.4.5 is to find out which of the critical thinking ability sub-test scores are the best predictors of the post-test overall critical thinking ability score in the experimental group. The regression model provided in Table 5.19 below identifies the significance of the post-test T-score.

Table 5.19 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.708[a]	.502	.363	33.28042

a. Predictors: (Constant), Evaluation_Post_Total, Interpretation_Post_Total, Recognition_Post_Total, Deductions_Post_Total, Inferences_Post_Total

The model presented in Table 5.19 implied that the study predictors, i.e., post-test T scores for each subtest, do, in fact, predict critical thinking at 50%, based on R Square = .502 , highlighted in yellow. This result also inferred that other variables, which were not tested, could have caused critical thinking. The model also indicated that there is a

strong collection correlation between critical thinking (dependent variable) and the study predictors (post-test T scores) at 71%, based on R= .708, highlighted in green.

An ANOVA test and the coefficient-correlation was used to find out which of the critical thinking ability sub-test scores are the best predictors of the post-test overall critical thinking ability score in the experimental group. The results of the ANOVA test and the coefficient-correlation are reflected in Tables 5.20 and 5.21, respectively.

Table 5.20 ANOVA[a] : Analysis of variance

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	20077.407	5	4015.481	3.625	.019[b]
	Residual	19936.551	18	1107.586		
	Total	40013.958	23			

a. Dependent Variable: Post-Test T-Score

b. Predictors: (Constant), Evaluation_Post_Total, Interpretation_Post_Total, Recognition_Post_Total, Deductions_Post_Total, Inferences_Post_Total

The ANOVA test is significant (p = 0.019). This implies that the predictors do, in fact, predict the dependent variable (critical thinking).

Table 5.21 Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-136.448	96.804		-1.410	.176
	Inferences_Post_Total	-3.897	1.863	-.473	-2.091	.051
	Recognition_Post_Total	16.303	4.438	.733	3.673	.002
	Deductions_Post_Total	3.376	3.042	.231	1.110	.282
	Interpretation_Post_Total	.881	1.995	.079	.442	.664
	Evaluation_Post_Total	-3.970	4.628	-.193	-.858	.402

a. Dependent Variable: Post-Test T-Score

The results from Table 5.21 indicates that the subtest 1 (Inferences) and subtest 5 (Evaluation of Arguments) both related negatively to critical thinking. However, the effect of this negative relationship was not significant for subtest 5 (Evaluation of Arguments). The negative relationship for subtest 1 (Inferences) had a low significance level at 95% level of confidence (p = 0.051), which is highlighted in blue. The main reason for this negative relationship, as highlighted in the descriptive statistics, is that this subtest had the lowest overall scores when compared to the other subtests.

In addition, subtest 2 (Recognition of Assumptions), subtest 3 (Deduction) and subtest 4 (Interpretation) relate positively to critical thinking. However, the positive relationship between subtest 3 (Deduction) and subtest 4 (Interpretation) and critical thinking are not significant. However, the positive relationship between subtest 2 (Recognition of Assumptions) and critical thinking is significant at the 98% confidence level (p=0.002), highlighted in yellow. This result implies that subtest 2 (Recognition of Assumptions) was a major predictor of critical thinking ability among the experimental group in the post-test. This concurs with the descriptive statistics, which indicated that subtest 2 (Recognition of Assumptions) was the highest scoring subtest for both groupings.

The results for the ANOVA test and coefficient-correlation, reflected in Tables 5.20 and 5.21, showed that the predictors (post-test scores for the various subtests) do, in fact, predict the dependent variable (critical thinking). Consequently, the alternate hypothesis Ha_4, i.e., the variance in the overall critical thinking ability score on the post-test of the experimental group will be significantly explained by the respective critical thinking ability sub-test scores, can be accepted and the null hypothesis Ho_4 can be rejected.

5.5 Norm group comparisons

In line with the requirements, as laid down in the W-GCTA user guide and technical manual, appropriate norm groups were identified from the available norm groups provided (*Watson-Glaser critical thinking appraisal user guide and technical manual* 2012: 57). These norm groups were as follows: US high school grade 12 students; and US first year of 4 year college students. The results of the current study were compared

to the aforementioned norm groups. The percentage mean scores were not used for this comparison since these were not provided in the WGCTA manual. Consequently the mean scores for the pre-and post-tests for both the control and experimental groups were used for the norm group comparisons. The pre-test and post-test mean scores of the control and experimental groups were compared to the two US norm groups, as shown in Table 5.22.

Table 5.22 Mean scores of both groupings vs US norm groups

	Control group		**Experimental group**		**US high school grade 12 Norm group 1**	**US first year of 4 year college Norm group 2**
	Pre-test	Post-test	Pre-test	Post-test		
Mean scores	20.90	24.60	38.50	47.50	39.50	45.90

A norm group summary was done using GraphPad Prism 5, which tests the p-value indicating whether the means between the groups were significant at the 95% confidence level (2-tailed).

Table 5.23 compares the pre-and post-tests' mean scores of the control group with the US norm groups.

Table 5.23 Comparison of the control group with the US norm groups

Control group	Pre-test vs US High school grade 12	Post-test vs US High school grade 12	Pre-test vs US first year of 4 year college	Post-test vs US first year of 4 year college
P value	<0.0001	<0.0001	<0.0001	<0.0001
P value summary	***	***	***	***
Are means significantly different? (p<0.05)	Yes	Yes	Yes	Yes
One-or two-tailed P value	Two-tailed	Two-tailed	Two-tailed	Two-tailed

The results from Table 5.23 indicate that, for both the pre-test and the post-test, the control group's means were significantly different to both the US high school grade 12 students; and the US first year of 4 year college students. These significant differences were in favour of the US norm groups. The mean scores reflected in Table 5.22 indicated higher mean scores for the two US norm groups, as opposed to the control group's pre-and post-test mean scores. The comparison of the pre-and post-tests of the experimental group with the US norm groups is presented in Table 5.24.

Table 5.24 Comparison of the experimental group with the US norm groups

Experimental group	Pre-test vs US High school grade 12	Post-test vs US High school grade 12	Pre-test vs US first year of 4 year college	Post-test vs US first year of 4 year college
P value	0.6579	0.0024	0.0014	0.5487
P value summary	Not significant	**	**	Not significant
Are means significantly different? ($p<0.05$)	No	Yes	Yes	No
One-or two-tailed P value	Two-tailed	Two-tailed	Two-tailed	Two-tailed

The results from Table 5.24 indicated that, when compared with the first norm group, i.e., the US high school grade 12 students, the pre-test mean scores of the experimental group showed no significant difference. This indicated little or no difference between their mean scores, which was evident in Table 5.22. However, it is noteworthy that the post-test mean scores of the experimental group showed a significant difference, in favour of the experimental group. As reflected in Table 5.22, the post-test mean scores of the experimental group increased above those of the US high school grade 12 students. This result suggested that the experimental group experienced gains in their critical thinking ability post-integrated assessment.

Table 5.24 also revealed the following results when compared to the second norm group, i.e., the US first year of 4 year college students. The pre-test mean scores of the experimental group showed a significant difference in favour of the US first year of 4 year college students. This indicated that the norm group's mean scores were higher than the experimental group's pre-test mean scores, as reflected in Table 5.22. However, it is noteworthy that the post-test mean scores of the experimental group showed no significant difference. This signifies little or no difference in the post-test scores of the experimental group and the US first year of 4 year college students.

These results implied that, at the start of academic year, prior to the integrated assessment, the experimental group's pre-test mean scores were closely matched with the US high school grade 12 students, but were lower than the US first year of 4 year college students. However, after the completion of the integrated assessment, the experimental group's post-test mean scores were higher than the US grade 12 students and were closely matched to the US first year of 4 year colleges. This result suggested that the experimental group experienced gains in their critical thinking ability post-integrated assessment.

In addition to the two US norm groups, the results of the current study were also compared to a South African norm group, which had been identified in the Lombard and Grosser study of 2008. The pre-test and post-test mean scores of the control and experimental groups were compared to the Lombard and Grosser SA norm group, as shown in Table 5.25.

Table 5.25 Mean scores of both groupings vs SA norm group

	Control group		**Experimental group**		**Lombard and Grosser SA Norm group**
	Pre-test	Post-test	Pre-test	Post-test	
Mean scores	20.90	24.60	38.50	47.50	34.20

Table 5.26 compares the pre-and post-tests' mean scores of the control group with the SA norm group.

Table 5.26 Comparison of the control group with the SA norm group

Control group	Pre-test vs Lombard and Grosser	Post-test vs Lombard and Grosser
P value	0.0032	0.2070
P value summary	**	Not significant
Are means significantly different? ($p<0.05$)	Yes	No
One-or two-tailed P value	Two-tailed	Two-tailed

The results from Table 5.26 indicated that, when compared to the SA norm group, the control group's pre-test mean scores showed a significant difference in favour of the SA norm group. In addition, Table 5.26 revealed no significant difference between the SA norm group and the control group's post-test mean scores. Despite the results of GraphPad Prism 5, indicating no significant difference in the mean scores of the SA norm group and the post-test mean scores of the control group, it was evident from Table 5.25 that the control group's mean scores increased from the pre-test to the post-test. This may be as a result of cumulative activities across the curriculum, as mentioned earlier in the chapter. This is also corroborated by the findings of the descriptive statistics. Table 5.27 compares the pre-and post-tests' mean scores of the experimental group with the SA norm group.

Table 5.27 Comparison of the experimental group with the SA norm group

Experimental group	Pre-test vs Lombard and Grosser	Post-test vs Lombard and Grosser
P value	0.5158	0.1366
P value summary	Not significant	Not significant
Are means significantly different? ($p<0.05$)	No	No
One-or two-tailed P value	Two-tailed	Two-tailed

The results from Table 5.27 indicate that for both the pre-test and the post-test the experimental groups means were not significantly different to the SA norm group. This implied that there was little or no difference between the two groups. Despite the results of GraphPad Prism 5, indicating no significant difference in the mean scores of the SA norm group and the pre-and post-test mean scores of the experimental group, it was evident from Table 5.25 that the experimental group's mean scores increased from the pre-test to the post-test. The post-test mean scores of the experimental group were substantially higher than both the control group and the SA norm group. The gains in the mean scores of the experimental group may be attributable to the integrated assessment. The descriptive statistics also concur with these findings.

5.6 Conclusion

This chapter presented the results and discussed the findings obtained from the Watson-Glaser Critical Thinking Appraisal. The W-GCTA subtests' results were analysed using both descriptive and inferential statistics. The inferential statistics tested the hypotheses of the current study and included correlations and regression analysis. In addition, the results of the current study were compared to other relevant empirical studies as well as three norm groups, which had been identified in chapter 4. The main objective (1.6.4) and each of its five sub-objectives were addressed by the current chapter.

The next chapter will provide an overview of the literature reviewed and explain how the aim and objectives of the current study were attained. It will present conclusions related to the findings and also makes recommendations for practice based on the objectives. The limitations of the current study will be highlighted and the areas for further research will be explored.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The previous chapter presented the results and discussed the findings obtained from the Watson-Glaser Critical Thinking Appraisal. The W-GCTA subtest results were analyzed using both descriptive and inferential statistics and compared to three norm groups which had been identified in chapter 4.

This chapter provides an overview of the literature reviewed and explains how the aim and objectives of the current study are attained. It presents conclusions related to the findings and also makes recommendations for practice based on the objectives. The limitations of the current study are highlighted and the areas for further research are explored.

6.2 Summary of the current study

An integrated assessment was designed in 2010 for the first-year ECP students in the Department of Management Accounting at the DUT, with the support of the Centre for Excellence in Learning and Teaching (CELT). This integrated assessment has been implemented from 2011 to date. The aim of this integrated assessment was to develop the critical thinking skills of the ECP students. These students had been identified as being underprepared and not being able to cope with the higher education workload, due to their educational backgrounds. Consequently, the development of critical thinking skills would assist these students in coping with subsequent levels of study, and with the workplace requirements.

The aim of the current study was to determine if an integrated assessment can enhance the critical thinking skills of the first-year ECP students in the Department of Management Accounting at the Durban University of Technology. In order to

accomplish the aforementioned aim, the following objectives, as mentioned in chapter 1, were addressed in the study:-

Objective 1.6.1: to explore critical thinking skills within the higher education context;

Objective 1.6.2: to examine integrated assessments within the higher education context;

Objective 1.6.3: to identify the relationship between integrated assessments and critical thinking;

Objective 1.6.4: to investigate whether the integrated assessment conducted with the Extended Curriculum Programme has improved the critical thinking competencies of these students. To achieve this objective, the following sub-objectives were addressed in the study;

Sub-objective 1.6.4.1: to determine the pre-test and post-test critical thinking ability scores of the experimental and control groups, respectively;

Sub-objective 1.6.4.2: to assess whether there is a statistically significant difference in the pre-test critical thinking ability scores of the experimental and control groups;

Sub-objective 1.6.4.3: to ascertain whether there is a statistically significant difference between the pre-test and post-test critical thinking ability scores of the experimental and control groups, respectively;

Sub-objective 1.6.4.4: to determine whether there is a statistically significant difference in the post-test critical thinking ability scores between the experimental and control groups; and

Sub-objective 1.6.4.5: to find out which of the critical thinking ability sub-test scores are the best predictors of the post-test overall critical thinking ability score in the experimental group.

Objectives 1.6.1 to 1.6.3 were addressed by the literature reviewed in chapters 2 and 3. How these objectives were addressed by the literature will be explored in the latter part of the current chapter. Objective 1.6.4 and its five sub-objectives were addressed by the empirical results presented in chapter 5.

The literature review identified the research problem/gap of the current study, i.e., the failure of higher education to inculcate critical thinking skills in its graduates, resulting in graduates being underprepared for the world of work. The literature review discussed the theoretical framework that underpinned the study with a comprehensive examination of the dependent variable (critical thinking) and the independent variable (integrated assessments). The literature review also explored other studies, both nationally and internationally, which made use of the Watson Glaser Critical Thinking Appraisal to measure the critical thinking skills of first-year students at tertiary institutions.

The research methodology provided an overview of the research purpose, strategy, design, sample selection and data collection instrument used by the researcher to solve the research problem. This was a descriptive study. It employed a quantitative strategy, with a quasi-experimental, pre-test, post-test, non-equivalent group design and it was longitudinal in nature. The target population consisted of 40 students in the control group (first-year ECP students registered for the National Diploma: Accounting) and 40 students in the experimental group (first-year ECP students registered for the National Diploma: Cost and Management Accounting) in the 2014 academic year. Since the data was collected from every member of the target population, the current study was viewed as a census study.

The W-GCTA UK edition, a standardized critical thinking test, was used to collect the quantitative data. This instrument was chosen since a discipline specific critical thinking test was not available within the South African context. All five categories of the W-GCTA were administered to both the control and experimental groups at two points

within the academic year, i.e., in the last week of March 2014 (pre-test) and first week in September 2014 (post-test). The W-GCTA results of the subtests were analyzed using both descriptive and inferential statistics. The descriptive statistics provided an overview of the participants' profile and ascertained their performance on each of the subtests. The inferential statistics tested the hypotheses of the current study and included correlations and regression analysis. The results of the current study were compared to national and international studies, reviewed in chapter 2, which had used of the W-GCTA to measure the gains in the critical thinking skills of first-year students at tertiary institutions. In addition, the results of the current study were also compared to two US norm groups and one local norm group.

6.3 Presentation of conclusions based on the findings

The following section presents a brief discussion on the achievement of the research objectives and the findings from the comparisons of the norm group.

Objective 1.6.1: To explore critical thinking skills within the higher education context

This objective was addressed by the literature reviewed in chapter 2. As mentioned earlier, the problem/gap identified by the literature was the inability of graduates to cope with the demands of the workplace. Graduates required numerous skills and competencies for the world of work, but critical thinking was viewed as the most valuable skill that could be imparted to graduates (Thompson 2011: 1). The literature identified critical thinking as the powerful enabling factor that ensured students' adaptability to the work environment. Consequently, institutions of higher learning, both nationally and internationally, listed the augmentation of critical thinking skills as the principle outcome of higher education. Critical thinking was linked to the constructivist approach of teaching and learning, which has become an integral part of the South African higher education system. This approach supported lifelong learning, learner-

centredness, participative teaching and problem-based learning. Despite the constructivist approach being emphasised at institutions of higher learning, the teacher-centred approach, which stifled critical thinking, still dominated classroom and assessment practices (Lombard, K and Grosser 2008: 572-573). Numerous empirical studies viewed assessments as the vehicle of change in higher education (Boud and Falchikov 2006: 400; Boud and Associates 2010: 1; Osborne, Dunne and Farrand 2013: 2). Assessments were seen as the key that would enhance students' employability and close the gap between higher education and the workplace requirements (Wilson 2012, as cited by Osborne, Dunne and Farrand 2013: 1-2).

It is noteworthy that the literature reviewed in chapter 2 explored critical thinking within the higher education context and, consequently, addressed objective 1.6.1. Institutions of higher learning were mandated to provide graduates with critical thinking skills. However, in order to achieve this mandate, teaching and, in particular, assessment practices at institutions of higher learning needed to be rethought and transformed (Boud and Associates 2010). This transformation, required in assessment practices, led to the development of objectives 1.6.2 and 1.6.3, which examined integrated assessments within the higher education context, and identified the relationship between integrated assessments and critical thinking, respectively.

Objective 1.6.2: To examine integrated assessments within the higher education context

This objective was addressed by the literature reviewed in chapter 3. Empirical evidence stated that the existing assessment practices within higher education were not preparing students for lifelong learning (Boud and Falchikov 2006: 400). These traditional assessment methods, i.e., tests, examinations and academic essay writing

were not well matched in preparing students for the world of work due to the fact that students would not be required to perform these tasks in the work environment.

Learner-orientated assessments were better matched for the world of work, since they were contextualized and interdisciplinary. They focused on problems that were encountered in the real-world and required students to use their knowledge from the various disciplines in order to solve these problems (Huba and Freed 2000: 1). The current study focused on two types of learner-orientated assessments, i.e., authentic assessments (contextualized) and integrated assessments (interdisciplinary).

Based on empirical evidence, authentic assessments were viewed as better suited for employability since they focused on problems or tasks that graduates would encounter in the work place (Osborne, Dunne and Farrand 2013: 2). The integrated assessment designed for the first-year ECP students was an authentic assessment since it was based on a problem encountered within the South African context, i.e., small business failure. This integrated assessment required students to use their knowledge from their first-year modules/subjects to provide advice to chosen small businesses on how to improve their profitability. This integrated assessment culminated with students preparing a business plan with a follow-up report, which suggested possible ways in which the chosen small businesses could improve their day-to-day operations and, consequently, make the transition from survivalist to a profitable entity that would exist in the foreseeable future. It is evident that the integrated assessment empowered students to think like practitioners and not like students.

The DUT assessment policy is based on the philosophy of student-centredness and promotes the use of various methods of assessments, particularly those types of assessments that encourage critical thinking and problem solving in “discipline-or profession-specific contexts”. This policy also, asserts that academics, as assessors,

must endeavour to adopt an integrative approach to knowledge that seeks to demonstrate the interconnectedness of knowledge, as reflected in the exit level outcomes of an academic programme (Durban University of Technology. Centre for Excellence in Learning and Teaching 2014: 2).

Despite the fact that the DUT assessment policy promotes the use of integrated assessments, this type of assessment is not widely used at the DUT. It is, therefore, the researcher's intention to promote the use of integrated assessments at the DUT. It is evident that the literature reviewed in chapter 3 addressed integrated assessments within the higher education context. The next objective explored the link between integrated assessments and critical thinking.

Objective 1.6.3: To identify the relationship between integrated assessments and critical thinking

This objective was addressed by the literature reviewed in the latter part of chapter 3. It was evident from the literature reviewed that interdisciplinary content was required for critical thinking (Halx and Reybold 2005: 302). Consequently, the use of too many stand-alone assessments should be discouraged since this inhibited critical thinking as students would do surface learning in order to cope with the volume of work (Vanderheide and Walkington 2008: 352). These stand–alone formative assessments compartmentalized learning and failed to show students how knowledge was interrelated. It was suggested that, in order to promote critical thinking, educators must shift their focus from subject isolation to subject integration (Thompson 2011: 1). Assessments must, therefore, be prepared across modules/subjects and programmes with corresponding integrated tasks (Boud and Associates 2010).

Objective 1.6.3 has been addressed as the link between critical thinking and integrated assessments was evident from the literature reviewed. Even as the link between integrated assessments and critical thinking became evident, it was the researcher's intention to determine whether the integrated assessment conducted with the first-year ECP students in the Department of Management Accounting at the DUT had enhanced the critical thinking competencies of these students. Objective 1.6.4 and its five sub-objectives will each be discussed in order to establish whether the integrated assessment conducted with the first-year ECP students had, in fact, improved the critical thinking skills of these students.

Objective 1.6.4: To investigate whether the integrated assessment conducted with the Extended Curriculum Programme has improved the critical thinking competencies of these students

To achieve this objective, five sub-objectives were addressed by the current empirical findings presented in chapter 5.

Sub-objective 1.6.4.1: To determine the pre-test and post-test critical thinking ability scores of the experimental and control groups, respectively

This sub-objective was achieved by the descriptive statistics in chapter 5, which presented both the pre-test and post-test results of the control and experimental groups. The descriptive statistics ascertained changes, if any, that may have occurred in the control group's critical thinking skills; and determined changes, if any, that may have occurred in the experimental group's critical thinking skills. This was done by analyzing both the pre-test and post-test scores, per subtest and in total.

It was noteworthy that both the control and experimental groups achieved a modest increase in their overall mean scores from the pre-test to the post-test. Despite the

modest increase in the overall post-test scores, the experimental group achieved a larger increase in comparison to the control group. These findings were similar to the Barnett and Francis (2012: 207) study, which indicated that the students, who were exposed to the higher-order thinking questions, achieved the largest increase in their pre-to post-test results.

Sub-objective 1.6.4.2: To assess whether there is a statistically significant difference in the pre-test critical thinking ability scores of the experimental and control groups

This sub-objective was achieved by the Mann-Whitney *U* test and the descriptive statistics, presented in chapter 5. The Mann-Whitney *U* test was used to determine whether the pre-test mean scores between the groups were significantly different. The results of the Mann-Whitney *U* test indicated that there was a statistically significant difference in the overall pre-test critical thinking ability scores of the experimental and control groups. The p-value indicated a high significance level at the 99% level of confidence (p=0.004). The statistical significance in the overall pre-test scores was in favour of the control group. These results were corroborated by the summary of the overall subtest results presented under the descriptive statistics shown in Table 5.12, in chapter 5. The overall pre-test score of the control group was marginally higher than the overall pre-test score of the experimental group, i.e., 45% and 43%, respectively.

Sub-objective 1.6.4.3: To ascertain whether there is a statistically significant difference between the pre-test and post-test critical thinking ability scores of the experimental and control groups, respectively

This sub-objective was achieved by the Mann-Whitney *U* test and the descriptive statistics, presented in chapter 5. The Mann-Whitney *U* test was used to determine whether the mean scores between the pre-test and post-test for both groups were significantly different. The results of the Mann-Whitney *U* test indicated that there was a statistically significant difference in the pre-test and post-test critical thinking ability

scores of the control and experimental groups. The p-value indicated a high level of significance for both groupings at the 99% level of confidence, i.e., p=0.000 and p=0.014 for the control and experimental groups, respectively. The Barnett and Francis (2012: 206) study also showed a significant improvement in the post-test results over one semester at the 99% level of confidence (p = 0.005). These results were validated by the summary of the overall subtest results presented under the descriptive statistics in Table 5.12, in chapter 5. The overall scores for the control group increased from 45% in the pre-test to 48% in the post-test. Similarly, the overall scores for the experimental group increased from 43% in the pre-test to 50% in the post-test.

Sub-objective 1.6.4.4: To determine whether there is a statistically significant difference in the post-test critical thinking ability scores between the experimental and control groups

This sub-objective was achieved by the Mann-Whitney *U* test and the descriptive statistics, presented in chapter 5. The Mann-Whitney *U* test was used to determine whether the post-test mean scores between the groups were significantly different. The results of the Mann-Whitney *U* test indicated that there was a statistically significant difference in the overall post-test critical thinking ability scores of the experimental and control groups. The p-value indicated a high significance level at the 99% level of confidence (p=0.000). The statistical significance in the overall post-test scores was in favour of the experimental group. These results were verified by the summary of the overall subtest results presented under the descriptive statistics in Table 5.12, in chapter 5. The overall post-test score of the experimental group was slightly higher than the overall post-test score of the control group, i.e., 47% and 50%, respectively.

Sub-objective 1.6.4.5: To find out which of the critical thinking ability sub-test scores are the best predictors of the post-test overall critical thinking ability score in the experimental group

Regression analysis was conducted to address this sub-objective. The summarized regression model, presented in chapter 5, implied that the study predictors, i.e., post-test T scores for each subtest, did, in fact, predict critical thinking at 50%, based on R Square = .502. This model also assumed that other variables, which were not tested, could have caused critical thinking. The model indicated a strong correlation between critical thinking (dependent variable) and the study predictors (post-test T scores), at 71%, based on R= .708.

An ANOVA test and coefficient-correlation was used to find out which of the critical thinking ability sub-test scores were the best predictors of the post-test overall critical thinking ability score in the experimental group. The ANOVA test was significant (p= 0.019), which implied that the predictors did, in fact, predict the dependent variable (critical thinking). The coefficient-correlation indicated that subtest 1 (Inferences), related negatively to critical thinking. The negative relationship for subtest 1 (Inferences) had a low significance level at 95% level of confidence (p = 0.051). The reason for this negative relationship was that this subtest had the lowest overall scoring patterns when compared to the other subtests. This was corroborated in the summary of the overall subtest results presented under the descriptive statistics in Table 5.12, in chapter 5.

The coefficient-correlation indicated that subtest 2 (Recognition of Assumptions), related positively to critical thinking. The positive relationship between subtest 2 (Recognition of Assumptions) and critical thinking was significant at the 98% confidence level (p=0.002). This implied that subtest 2 (Recognition of Assumptions) was a major predictor of critical thinking ability among the experimental group in the post-test. This subtest exhibited the most consistent scoring patterns compared to the other subtests, with scores consistently above 50% in both the pre-and post-tests. These results were verified in the summary of the overall subtest results presented under the descriptive statistics in Table 5.12, in chapter 5. The results for the ANOVA test and coefficient-correlation showed that the predictors (post-test T scores for the various subtests) do, in

fact, predict the dependent variable (critical thinking). Consequently, the aforementioned sub-objective was achieved.

From the discussion, it is evident that the four objectives and sub-objectives identified by the research study have all been accomplished. Consequently, the research aim was also realized.

Norm group comparisons

The results from the norm group comparisons implied that, at the start of academic year, prior to the integrated assessment, the experimental group's pre-test mean scores were closely matched with the US high school grade 12 students, but were lower than the US first year of 4 year college students. However, after the completion of the integrated assessment, the experimental group's post-test mean scores were higher than the US grade 12 students and were closely matched to the US first year of 4 year colleges. In addition, the experimental group's pre-and post-test mean scores were closely matched to the SA norm group.

It is noteworthy that, although the control group's mean scores increased slightly from the pre-test to the post-test, their post-test scores were lower than the two US norm groups and the SA norm group. These results suggested that the experimental group experienced gains in their critical thinking ability in the post-integrated assessment. Consequently, the gains in the mean scores of the experimental group may be attributable to the integrated assessment. The descriptive statistics, provided in chapter 5, concur with these findings.

6.4 Recommendations

Based on the research findings, the following recommendations are offered to enhance the critical thinking skills of students at tertiary institutions.

From the empirical finding of the current study, it is evident that the integrated assessment conducted with the ECP students in the Department of Management Accounting at the DUT has enhanced the critical thinking skills of these students.

6.4.1 Using integrated assessments to link theory and practice

It is not always possible for Universities of Technology to offer cooperative education/ in-service training to all students. Contextualized integrated assessments, therefore, bridge this gap by allowing students to experience workplace requirements without physically being in the work environment. It is, therefore, recommended that integrated assessments, which are based on real world problems, should be conducted in the first year and in subsequent years. The integrated assessments conducted at first-year level is to ensure that students are socialized to the university requirements, while the integrated assessments, conducted in subsequent years of study, is to ensure that students maintain the gains in their critical thinking skills, through appropriate practice. This will ensure the transferability of the critical thinking skills to the work environment, since students practise thinking like practitioners and not like students.

6.4.2 Developmental requirements and training needs

The development of integrated assessments can be challenging for educators, who are experts in their respective disciplines but not necessarily experts in teaching and learning practices. Consequently, educators must be provided with training in teaching and assessing critical thinking skills. The development of an integrated assessment should involve: assistance from university centres for learning and teaching; all academics who are teaching on the respective programmes; as well as external stakeholders, i.e., industry and professional body representatives. Each of these groups has an essential role to play in the development of integrated assessments.

The university centres for teaching and learning ensure that the outcomes of the programme are aligned to critical thinking, and that staff receive the necessary training

in teaching and assessing critical thinking skills. Collaboration between academics who teach on the programme is essential as this provides students with a richer learning experience, as the links between the various modules/subjects within the programme become evident. Partnerships with industry liaison committees and the relevant professional bodies assist in the development of integrated assessments by identifying the critical thinking skills required from graduates. These partnerships with the external stakeholders are essential since they provide academics with an understanding of the workplace requirements.

6.4.3 Change in perception will change the culture of assessment

There are various benefits of integrated assessments as opposed to numerous stand-alone assessments. Integrated assessments assess numerous modules/subjects, thereby relieving the assessment burden that students face. Consequently, students have more time to internalize and understand how the subject matter is linked. This approach enhances critical thinking skills. Despite the benefits of integrated assessments in the development of critical thinking skills, traditional assessment types still dominate higher education. The change in assessment methods can only be brought about by a change in staff perceptions. This change must be driven from the top, down, i.e., from institutional level, to faculty level, to departmental level. This process of change must involve the university Centre for Quality Promotion and Assurance, who must conduct reviews across the university on the various aspects of assessment. Institution-wide support is, therefore, essential in order to change the culture of assessment. Reform will, however; only take place over an extended period of time.

What is the point of universities who cannot teach students to think critically? The primary role of academics is not to cover content, but to teach students to think critically. It is hoped that this study would inform and improve assessment practices at the DUT and other institutions of higher learning.

6.5 Limitations

The data collection instrument and sample size were limitations of the current study. Although the W-GCTA has a long history and has been used in numerous countries and settings, including South Africa, an instrument designed specifically for the South African context would have been more appropriate. From the literature reviewed, it was evident that such a culturally appropriate critical thinking test is not available at present within South Africa (Lombard, K and Grosser 2008: 566). It is hoped that further research would be conducted in this area and that a critical thinking test will be designed specifically for the South African context.

Ideally, the researcher would have preferred to use a larger sample but was restricted by the Department of Higher Education and Training requirement. Based on these limitations, the findings of this study cannot be generalized for similar studies conducted with a specifically-designed instrument and with a larger sample.

6.6 Suggestions for further research

Since teaching, learning and assessment are interrelated, future research studies should focus on both the teaching and assessment of critical thinking skills. Such studies will ensure that higher education institutions produce competent graduates, who can contribute to their professions as well as society at large.

Critical thinking comprises of both cognitive skills and dispositional attitudes. These components are interrelated. The current study only focused on the cognitive skills and not the dispositional attitudes of students, since the instrument used, i.e., the W-GCTA, did not adequately measure the dispositional attitudes of critical thinking. Consequently, further research should be conducted in which the cognitive skills and dispositional attitudes of critical thinking are collectively assessed.

Since the current study was conducted at the Durban University of Technology, it is allied to one of the aims of the DUT assessment policy, which is to encourage academics to research assessment practices that would enhance the quality of student learning (Durban University of Technology. Centre for Excellence in Learning and Teaching 2014: 3).

In addition, further research should also investigate employer perceptions of the job readiness of graduates who have been exposed to integrated assessments.

6.7 Conclusion

This chapter provided an overview of the literature reviewed and explained how the aim and objectives of the current study were attained. It presented conclusions related to the findings and also made recommendations based on the objectives. The limitations of the current study were highlighted and the areas for further research were explored.

This study was successful in achieving its stated aim and objectives. It is the researcher's fervent hope that this study will provide the impetus for other similar studies to be conducted at the DUT and other universities to enhance students' skill levels which are such an essential ingredient for the development of the South African economy.

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APPENDIX A

LETTER OF INFORMATION

Title of the Research Study: The impact of the integrated assessment on the critical thinking skills of the first year Extended Curriculum Programme students in the Department of Management Accounting at the Durban University of Technology

Principal Investigator/s/researcher: Melanie Bernice Cloete

Co-Investigator/s/supervisor/s: Dr Hari Lall Garbharran (D.P.A.)

Brief Introduction and Purpose of the Study: The Extended Curriculum Programme students have been identified as being underprepared and not being able to cope with the demands of higher education, due to their educational backgrounds. An integrated assessment was designed for these students in 2010 to enhance their critical thinking skills. The aim of this study is to determine whether this integrated assessment has enhanced the critical thinking skills of these students. The purpose of the study is to establish a causal relationship between two variables, integrated assessments (independent variable) and critical thinking (dependent variable).

Outline of the Procedures: The research participants would be required to complete the Watson Glaser Critical Thinking Appraisal (W-GCTA) multiple choice measure at two intervals within the academic year. The first interval would be at the start of the academic year (prior to the integrated assessment) and the second interval would be at the end of the integrated assessment. The Watson Glaser Critical Thinking Appraisal consists of 80 multiple choice questions and the approximate duration of the test is 60 minutes. In the event of the attrition rate between the pre-and post-tests being high, the researcher will be required to access data from the DUT management information system, in order to determine the appropriate cause.

Risks or Discomforts to the Participant: There will be no risks or discomforts to the participants.

Benefits: It is hoped that the critical thinking competencies of the participants would be enhanced by the exposure to the integrated assessment. The benefit to the researcher will be research publications both in conference proceedings and in accredited journals.

Reason/s why the Participant May Be Withdrawn from the Study: There will be no adverse consequences for the participants should they choose to withdraw from the study.

Remuneration: The participant will not receive any remuneration or incentive of any kind, for participating in the study. The W-GCTA is not linked to the duly performed of any module/ subject for which the research participant is registered.

Costs of the Study: The participant will not be expected to cover any costs towards the study.

Confidentiality: All the names of the participants' would remain anonymous and will not be used for any other purpose other than this research study. There will be no participants names mentioned in the write up of the dissertation. The data obtained from the management information system will also be kept confidential.

Research-related Injury: Due to the nature of the research, participants would only be required to complete the Watson Glaser Critical Thinking Appraisal multiple choice measure. It is, therefore, highly unlikely that the participant would obtain any research related injury from these activities. Consequently, there will be no compensation.

Persons to Contact in the Event of Any Problems or Queries:

Please contact the researcher on 081 4767406 or 031-373 6717, my supervisor Dr Hari Lall Garbharran on 082 267 3192 or 031 373 5740 or the Institutional Research Ethics administrator on 031 373 2900. Complaints can be reported to the DVC: TIP, Prof F. Otieno on 031 373 2382 or dvctip@dut.ac.za.

General:

Potential participants must be assured that participation is voluntary and the approximate number of participants to be included should be disclosed. A copy of the information letter should be issued to participants. The information letter and consent form must be translated and provided in the primary spoken language of the research population e.g. isiZulu.

APPENDIX B

CONSENT LETTER

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, **Melanie Bernice Cloete**, about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: **021/14**,
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

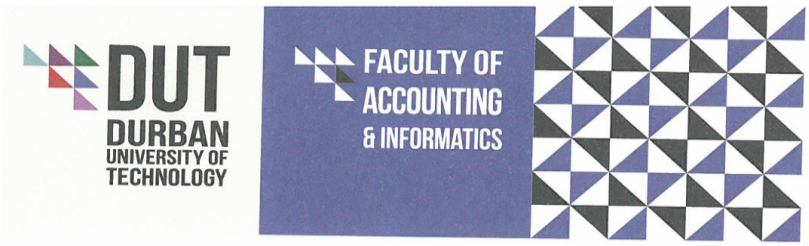
_____ _____ _____ _____

Full Name of Participant **Date** **Time** **Signature / Right Thumbprint**

I, _____ (name of researcher) herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

_____	_____	_____
Full Name of Researcher	**Date**	**Signature**
_____	_____	_____
Full Name of Witness (If applicable)	**Date**	**Signature**
_____	_____	_____
Full Name of Legal Guardian (If applicable)	**Date**	**Signature**

APPENDIX C: GATEKEEPER'S PERMISSION



To: Mrs M.B. Cloete

From : Mr D. Govender (Head of Department: Management Accounting)

Date: 2 April 2014

Re: Gatekeepers permission

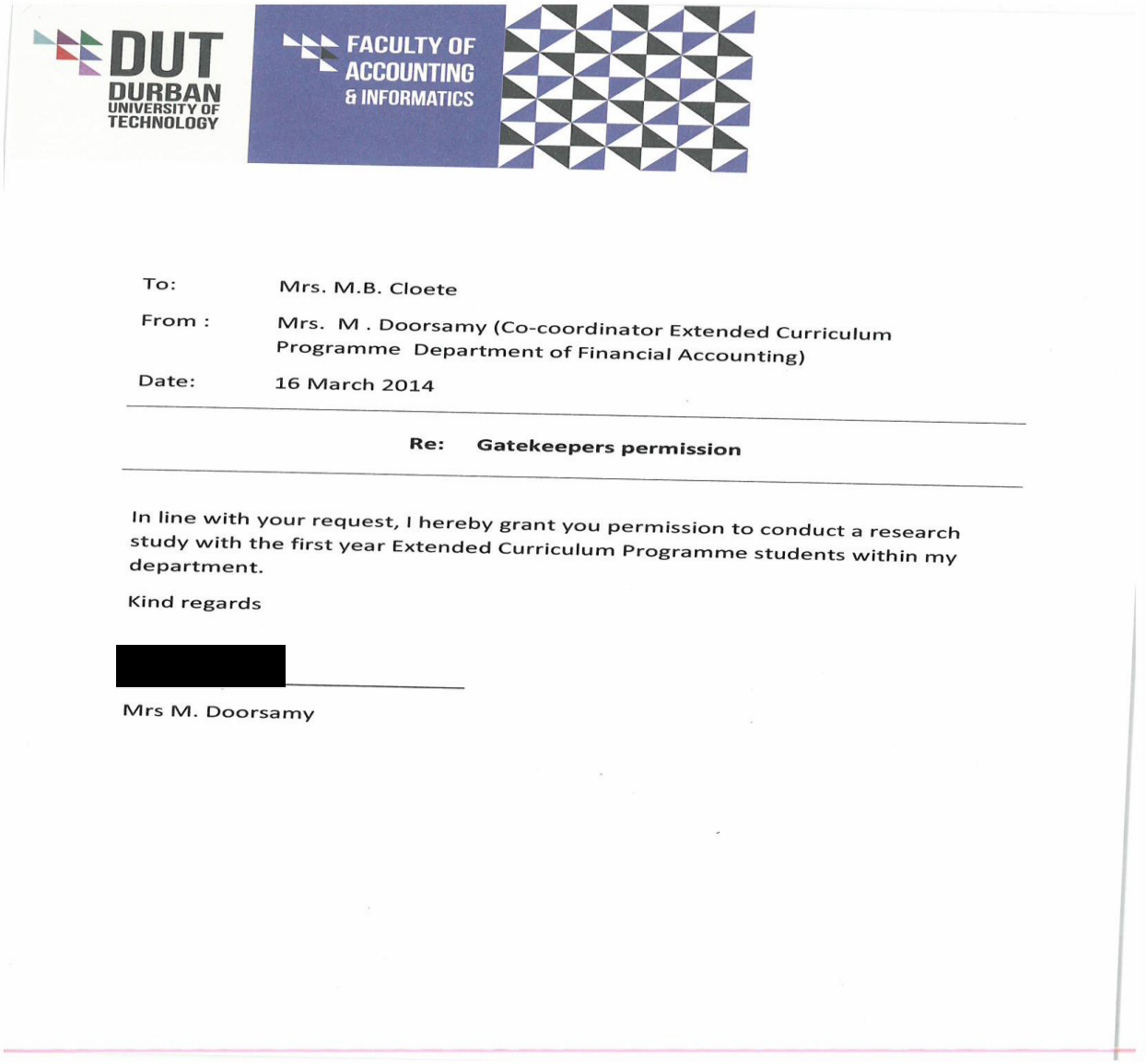
In line with your request, I hereby grant you permission to conduct a research study with the first year Extended Curriculum Programme students within my department.

Kind regards

[redacted]

Mr D Govender

APPENDIX C: GATEKEEPER'S PERMISSION



DUT
DURBAN UNIVERSITY OF TECHNOLOGY

FACULTY OF ACCOUNTING & INFORMATICS

To: Mrs. M.B. Cloete

From : Mrs. M . Doorsamy (Co-coordinator Extended Curriculum Programme Department of Financial Accounting)

Date: 16 March 2014

Re: Gatekeepers permission

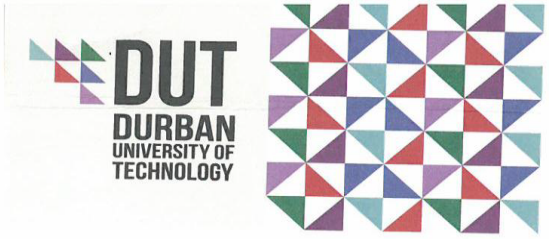
In line with your request, I hereby grant you permission to conduct a research study with the first year Extended Curriculum Programme students within my department.

Kind regards

[redacted]

Mrs M. Doorsamy

APPENDIX D: ETHICAL CLEARANCE



Institutional Research Ethics Committee
Faculty of Health Sciences
Room MS 49, Mansfield School Site
Gate 8, Ritson Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2900
Fax: 031 373 2407
Email: lavishad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

14 March 2014

IREC Reference Number: **REC 14/14**

Mrs M B Cloete
9 Paarl Road
Austerville
Durban
4052

Dear Mrs Cloete

The impact of the integrated assessment on the critical thinking skills of the first year Extended Curriculum Programme students in the Department of Management Accounting at the Durban University of Technology

I am pleased to inform you that Full Approval has been granted to your proposal REC 14/14.

The Proposal has been allocated the following Ethical Clearance number IREC 021/14. Please use this number in all communication with this office.

Approval has been granted for a period of one year, before the expiry of which you are required to apply for safety monitoring and annual recertification. Please use the Safety Monitoring and Annual Recertification Report form which can be found in the Standard Operating Procedures [SOP's] of the IREC. This form must be submitted to the IREC at least 3 months before the ethics approval for the study expires.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the IREC according to the IREC SOP's. In addition, you will be responsible to ensure gatekeeper permission.

Please note that any deviations from the approved proposal require the approval of the IREC as outlined in the IREC SOP's.

Yours Sincerely

[redacted]

Prof J K Adam
Chairperson: IREC