

The Development of a Modularised Curriculum for Computer Competency Courses for Technikon Learners

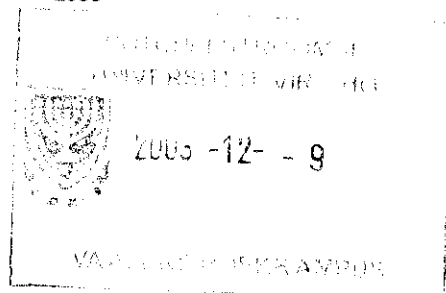
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Dissertation submitted for the degree Magister Educationis in Teaching and Learning
in the School for Educational Sciences, Potchefstroomse Universiteit vir Christelike
Hoër Onderwys

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Vanderbijlpark

2003



ACKNOWLEDGEMENTS

This dissertation is dedicated to all the people who care enough about education to evaluate and examine this work; to all those who cared enough to persistently encourage me to complete this research; and to the Lord, our Light and Salvation.

SUMMARY

The development of a modularised curriculum for computer competency courses for technikon learners

Key words: *action research, block module, end-user computing, experiential learning, integrative assessment, IT skills/literacy/competency, learning/teaching strategy, modularisation, outcomes-based education*

This study investigated the implications that the scheduling of a block module for a computer competency course over two weeks, has had on the curriculum. The block module was presented at the start of the first semester, 2001 at the Vaal Triangle Technikon. The objectives were to:

- develop a flexible, outcomes-based curriculum in which the learners had to demonstrate capability and employability by integrating computer competencies in other modules;
- design and implement an effective learning and teaching strategy in order to ensure that learners will achieve the learning outcomes within two weeks; and to
- implement continuous, integrative assessment methods in order to foster the learning of hands-on skills that can be integrated in the learners' academic programmes.

The researcher followed an action research approach, in order to assess the improvement of current educational practices. A target group of first-year learners was divided into a block module-group and a semester-group. The researcher made use of data triangulation, by collecting qualitative and quantitative data comprising structured interviews and open-ended and structured questionnaires completed at different stages of the project.

This research report comprises three articles. The first article reports on the high success rate of the block module-group and reveal that these learners could retain, and utilise the computer competencies that they had to utilise for completing assignments, to a larger degree than the semester-group.

The second article reports that experiential learning, as an outcomes-based strategy, fosters learning in accelerated learning contexts.

The third article concludes that the continuous integrative approach to assessment fosters co-operation, feedback through self-assessment and the ability of learners to apply computer competencies in new situations.

It is recommended that lecturers in all the associated departments should collaboratively assign and assess tasks in progressive advanced modules. It concludes that, in order to utilise resources optimally when scheduling block modules, all associated departments would have to be fully modularised.

OPSOMMING

Die ontwikkeling van 'n gemodulariseerde kurrikulum vir rekenaarbevoegdheidskursusse vir teknikon leerders

Sleutelwoorde: *aksienavorsing, blokmodule, ervaringsleer, geïntegreerde assessering, IT vaardighede/geletterdheid/bevoegdheid, modularisasie, onderrig-/leerstrategie, rekenaar-eindgebruik, uitkomsgebaseerde onderwys*

In hierdie studie is die implikasies van die skedulering van 'n blokmodule vir 'n rekenaarvaardighedskursus aan die Vaaldrehoekse Technikon ondersoek. Die blokmodule is oor 'n tydperk van twee weke aan die begin van die eerste semester, 2001, aangebied. Die doel was om:

- 'n aanpasbare, uitkomsgebaseerde kurrikulum te ontwerp, waarin leerders bevoegdheid en indienseembaarheid deur die integrering van rekenaarvaardighede in ander modules, moes demonstreer;
- 'n effektiewe leer- en onderrigstrategie te ontwikkel, sodat leerders die leeruitkomst binne 'n bestek van twee weke kon bereik; en om
- kontinue, geïntegreerde assesseringsmetodes te implementeer ten einde te verseker dat leerders oor die nodige vaardighede beskik om dit in hulle ander akademiese programme te kan integreer.

Die navorser het 'n aksienavorsingsbenadering gevolg om huidige onderwyskundige praktyke te verbeter. 'n Teikengroep van eerstejaarleerders is in 'n blokmodule-groep en 'n semestergroep verdeel. Die navorser het beide van kwalitatiewe en kwantitatiewe navorsingsmetodes gebruik gemaak, om die data te versamel deur middel van gestruktureerde onderhoude en oop, sowel as gestruktureerde vraelyste wat op verskillende stadia van die projek voltooi is.

Hierdie navorsingsverslag bevat drie artikels. Die eerste artikel doen verslag oor die relatiewe hoë mate van sukses wat deur die blokmodule-groep behaal is, en onthul, dat daardie leerders die rekenaarvaardighede wat hulle vir die voltooiing van take moes aanwend, in 'n groter mate kon aanwend en behou.

Die tweede artikel toon aan dat die ervaringsleerstrategieë deur die leerders as uitkomsgebaseerd ervaar is, en dat dit leer in versnelde leeromgewings bevorder.

In die derde artikel is bevind dat die deurlopende en geïntegreerde benadering tot assessering daartoe lei dat samewerking, terugvoer deur middel van self-assessering, asook die bevoegdheid om rekenaarvaardighede in nuwe situasies te kan toepas, bevorder word.

Daar word aanbeveel dat werkopdragte gesamentlik deur lektore van alle verwante departemente vir meer gevorderde modules ontwerp en geassesseer moet word. Ten laaste is bevind dat die optimale benutting van fasiliteite slegs kan geskied as geassosieerde departemente ook volgens 'n blokmodule-stelsel georganiseer word.

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LIST OF ABBREVIATIONS

AL	Accelerated Learning
AOAEX	The Association for Online Academic Excellence
AR	Action Research
ARCEU	Action Research on Computer End-using
CHE	Council on Higher Education
CHRIE	International Council on Hotel, Restaurant & Institutional Education
CTM	Committee for Tutorial Matters
CTM-NQF	Committee for Tutorial Matters for the National Qualifications Framework
DCEU	Department of Computer End-using
DOE	Department of Education
ECDL	The European Computer Driving Licence
EL	Experiential Learning
ELO	Exit Level Outcome
EUC	End-user Computing
F&BM	Food and Beverage Management
FE	Further Education
FET	Further Education and Training
ICDL	International Computer Driving Licence
IS & T SGB	Information Systems and Technology Standard Generating Body
IT	Information Technology
LAN	Local Area Network
MCSE	Microsoft Certified Systems Engineer
NQF	National Qualifications Framework
OBE	Outcomes-based Education
OBET	Outcomes-based Education and Training
RPL	Recognition of Prior Learning
SA	South Africa
SANAS	The South African National Accreditation System
SAQA	South-African Qualifications Framework

SGB	Standard Generating Body
THETA	Tourism, Hospitality and Sport Education and Training Authority
VTT	Vaal Triangle Technikon
WAN	Wide Area Network

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CHAPTER 1

GENERAL ORIENTATION: STATEMENT OF THE PROBLEM, OBJECTIVES AND RESEARCH METHODOLOGY

1.1 INTRODUCTION

In South Africa the Higher Education Act (101/1997) has as its purpose, the transformation of the higher education system and its institutions through a single co-ordinated system that is both programme- and outcomes-based. According to the Higher Education Act, an outcomes-based approach will provide optimal opportunities for learning and will overcome inequality and inefficiency (SA, 1997a).

On 31 July 1998, all institutions of higher education recorded all their qualifications with the South African Qualifications Authority (SAQA) (SA, 1995:11). Based on standards set by the Standard Generating Bodies (SGB's), outcomes of interim registered technikon qualifications must be revisited during 2001 and from 30 June 2003 final submission of qualifications will be made with SAQA (CTM, 2001). This will ensure an outcomes-based curriculum that shares the vocational needs of our country. Furthermore, the Curriculum Development Committee of the Committee for Tutorial Matters for the National Qualifications Framework (CTM-NQF) identified modularisation as a major research project in order to determine the implications of the implementation of Outcomes-Based Education and Training (OBET) (CTM, 2001:16).

The use of Information Technology (IT) should be one of the key factors in all learning programmes in order to foster future success for both graduates and an increasingly technologically-oriented economy (Strydom, Hay & Strydom, 2001:5-7; Kgapola, 1999:40; SA, 1997b:5). It is, therefore, necessary for higher institutions to follow a fresh approach in addressing critical skills that complement the formal

education system, in order to provide the economy with a skilled workforce in a world where competition to become employed, is intense.

The significance of the research is underlined by the national transformation process and national needs, which are mentioned above. As a lecturer in the Department of Computer End-using (DCEU), Faculty of Applied and Computer Sciences at the Vaal Triangle Technikon (VTT), the researcher undertook this research to assist towards the transformation of the offering of computer competency courses for technikon learners through the development and implementation of a modular, outcomes-based curriculum for the discipline End-user Computing (EUC). The EUC module was scheduled for two weeks over 60 notional hours at the start of a semester.

This chapter outlines the problem statement and objectives of the study. It also outlines the research methodology, which involves a series of research cycles, the literature study, case study and the design of the empirical research.

1.2 RATIONALE FOR THE PROBLEM

The DCEU offers computer competency courses scheduled over one semester to a variety of learners from different faculties at different campuses of the Technikon. The DCEU experiences that only 2% of learners are computer competent when they enter the Technikon on NQF level 5. A major problem with the existing curriculum for computer competency courses is, that learners are not computer competent when the need arrives for them to apply their computer competencies in other courses or modules. Furthermore, assessment opportunities are not enough for a learner who 'fails' the course during the first semester, to 'pass' the course in the first year of study in the Higher Education and Training Band (NQF 5). Whereas Spady and Marshall (1991:68-69) reject the traditional perspective of calendar-driven programmes, administrative processes prescribe assessment to take place in semester or annual cycles. In an OBET system, curriculum designers are challenged to organise the curriculum around the successful achievement of

outcomes, rather than according to the duration of a course. Modular qualifications divide the curriculum into relatively short self-sufficient units of learning designed to comply with one or more learning outcomes. It encourages a gradual approach to achievement by including pre-assessment, more continuous assessment opportunities and credit accumulation (Du Pré, 2000:42; Hodgson & Spours, 1997:106). A block module, in particular, is a compacted curriculum that helps lecturers to focus on particular targets, encourages the development of cognitive skills, enables clear goal-setting over a short period of time (i.e. weeks), and supports co-operative learning, work-place training and action learning (Du Pré, 2000:2).

The increase in complexity and versatility in computer technology and software requires from all skilled workers to find, analyse, manage and integrate information within their respective careers. The integration of knowledge and skills across the curriculum, is crucial towards achieving applied competence, as defined in the NQF. Applied competence aims at integrating three discrete competencies namely, foundational, practical and reflective competencies (CHE, 2001:58). In the process of revisiting the learning outcomes of the various technikon qualifications, the DCEU is involved in formulating specified outcomes directed to transfer computer competencies to new situations, as well as the integration of the different end-user application software programs in finding solutions to the processing and presentation of information in a specific academic programme. The problem is thus, that learners should be computer competent as soon as possible in order for them to integrate the knowledge and skills in their respective academic programmes so that they can approach their careers successfully. In adopting integration and applied competence, the EUC module should seek to promote the integration of theory, practice and reflection.

It is clear from the previous paragraphs that there exists a need for dynamic interaction between the different components of the EUC curriculum. Therefore, the following research questions were formulated.

Question 1 How can the curriculum for computer competency courses be organised in order to foster capability, employability and orientation in the workplace through the integration of knowledge and skills?

Question 2 Which didactic strategies can be implemented to ensure that learners will achieve the learning outcomes as soon as possible?

Question 3 How and when should assessment take place in an outcomes-based curriculum for computer competency courses?

These questions challenged the researcher to utilise the advantages implied by a modular OBET system, with clearly defined outcomes and assessment criteria. Modularisation is often used as a pro-active approach to build a more flexible and coherent national qualification system, which underpins and contributes to the labour force, encourages personal responsibility and supports lifelong learning (Hodgson & Spours, 1997:106).

1.3 OBJECTIVES OF THE RESEARCH

The objectives of the research were to:

- develop a flexible, outcomes-based curriculum in which learners would not only have to demonstrate computer literacy or skills, but would also require to demonstrate capability, employability and orientation in the workplace through the integration of knowledge and skills;
- investigate and implement different didactic strategies so as to ensure that learners will achieve the learning outcomes as soon as possible; and to
- investigate and report on the conceivable determinants for assessment in a modular, outcomes-based curriculum for computer competency courses.

1.4 LIMITATION OF THE RESEARCH FIELD

1.4.1 Conceptualisation

The following two essential concepts contained in the title of this research report are explicated, in order to provide the reader with clarity on the focus of this research.

- Computer competency.
- Modularisation.

1.4.1.1 Computer competency

In less than a generation, IT competency has emerged in virtually any career from a nice-to-have skill to a job-critical-skill (Long & Long, 2001:14). Being computer literate, means that a learner has the knowledge and a broad understanding of computers and their uses (Shelly, Cashman & Vermaat, 2003:1.04; University of St Thomas, 2000; Webopedia, 2002). Information literacy also includes a critical attitude towards the information available, as well as towards technology in itself. However, in order to be functionally computer literate, learners need to understand information tools and resources as well as how to apply these resources in many of their courses and in their careers (University of St. Thomas, 2000). Webopedia (2002) defines a computer competent user as someone being able to use a personal computer at application level. For South African technikons (EUC Forum, 2001), undergraduates should become competent and comfortable in using computers in order to allow them to achieve professionalism in their chosen fields of study and to compete meaningfully in the market place.

Since knowledge and skills are often associated only with 'facts' or 'operational capabilities', the researcher will refer to competencies, which implies knowledge, skills, as well as attitudes.

1.4.1.2 Modularisation

The concept of modularisation evolved in higher education in the United States in the second half of the nineteenth century (Theodossin, 1986:135) and original local sources on modularisation are not readily available. The South African Higher Education system and more specifically technikons, had to come up with a 'South African' understanding and definition(s) of a module and modularisation, which would fit the niche market of technikon education, and the requirements of both the South African Qualifications Authority (SAQA) and the National Qualifications Framework (NQF). Learning programmes, therefore, are in the process to be redesigned in order to accommodate outcomes-based education and training. Lockett (1997) defines a module as a coherent, self-contained unit of learning, designed to achieve a set of specific learning outcomes that are assessed within that unit of learning. A module is a building block from which a programme (and its qualification) is constructed for which a learner may receive credit on successful completion. In their work document on modular education, the CTM (2001) concluded, that a module:

- must have explicit aims;
- must specify intended outcomes;
- must specify any prior learning requirements;
- will make clear the methods of learning and the context in which the learning activities take place;
- should provide for differentiated learning experiences; and
- may be subject-specific, occupation-specific, or a combination of these.

1.4.2 Limitation in terms of time frame

During 2000, the Department: Food at the VTT, was already in the process of revising preliminary registration documents to be submitted to SAQA for the qualification in Food and Beverage Management. Lecturers in this department shared the need with lecturers from the DCEU to present EUC as a module at the

start of the learners' first semester at the Technikon. The project was collaboratively planned from July 2000 and the module was implemented during 2001. Learners were post-assessed at the start of their second academic year of study during February 2002 in order to enable those involved to assess whether the learners retained their computer competencies. An advanced module for a second group of learners in the Department: Food was implemented during February 2003 in order to conclude the research in terms of integrated assessment.

1.5 RESEARCH METHODOLOGY

This study addresses the challenge to transform the current computer competency course and to make a scientific contribution towards the field of modularisation. It was, therefore, important to consider a research approach that could provide a framework in which to develop new strategies and competencies for complex tasks in an uncertain environment of rapid social and technological change (Zuber-Skerritt, 1996:xiii). An action research (AR) approach was followed in order to improve educational practices, to increase knowledge about the curriculum and to learn from the consequences of the changes. The four 'moments' of AR as interpreted by Kemmis and McTaggart (1988), Elliott (1991) and Zuber-Skerritt (1992), are to:

- develop a plan of action towards improving what is already happening;
- act by implementing the plan;
- observe the effects of the action in the context in which it occurs; and
- reflect on these effects as a basis for further planning through a succession of cycles.

In this research project, a group of lecturers with a commitment to improve educational practices, conducted a case study with a 'thematic concern' or central research theme, by breaking down their plan of action in achievable steps and

simultaneously progressing through a series of cycles in order to solve the research questions as formulated in the problem statement.

1.5.1 Research cycles

During the core AR project, i.e. the case study, the research team progressed through a series of planning/acting/observing/reflecting cycles of management practice with the thematic concern to determine to which degree modularisation of the discipline EUC would develop competent learners.

During the dissertation phase, the researcher also followed an AR approach while completing the fieldwork described above, through planning, stating the research problem and research questions, as well as through evaluating and forming conclusions in the light of the literature survey. This dissertation added another dimension to research writing, in the sense that conclusions were submitted for publication before the final dissertation-writing phase. Figure 1.1 shows the relationship between the core action research, article writing and dissertation writing as described above.

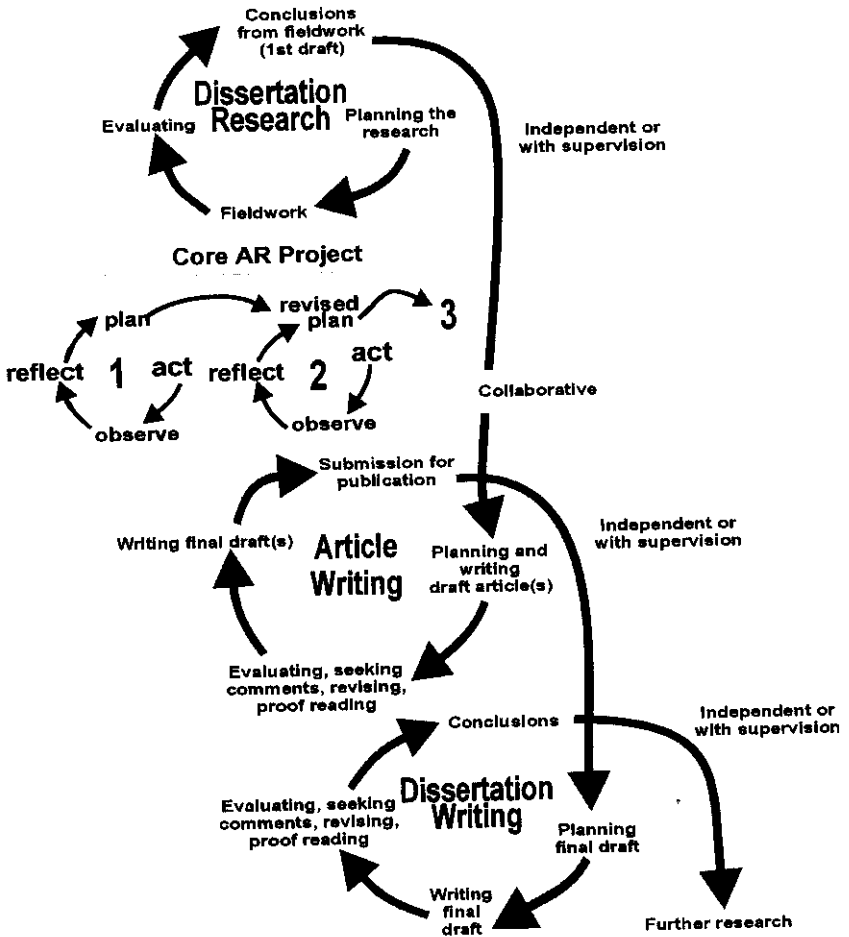


Figure 1.1 The relationship between core action research, dissertation research, and article writing for a dissertation (as adapted from Zuber-Skerritt, O. & Perry, C. 2002: 117)

1.5.2 Literature review

To thoroughly understand the context of the restructuring of higher education in SA in order to investigate, implement and report on the issues mentioned in paragraph 1.3, the researcher examined primary and secondary sources, which include reports and documents of national organisations and forums, during the time frame of this study. In order to identify relevant sources, computer searches on the EBSCO-host, ERIC, SABINET, INFOTRAC, NEXUS, NETSCAPE, and IXQUICK, databases were launched by using the following keywords: *action learning, action research, assessment, computer curriculum, computer skills/literacy, constructivist, curriculum development, experiential learning, IT skills/literacy/competency, learning strategy, modular curriculum, modularisation, NQF, outcomes-based education, SAQA, and unit standards.*

1.5.3 The core AR project: a case study

In a case study, research is directed at understanding the uniqueness and idiosyncrasy of a particular case in all its complexity. The objective usually is to investigate the dynamics of a single, bounded system, typically of a social nature, such as a group of learners (Welman & Kruger, 1999:21). In dealing with real life events, constraints and opportunities, choosing a multiple case study allows for replication logic that will tie together different points (Benson-Soong, Hock, Boon, & Koah, 2001:104).

A research project named Action Research on Computer End-using (ARCEU) was conducted by means of two case studies, one at the East Rand satellite campus and the other at the Vanderbijlpark main campus of the VTT during the period 2000 – 2002. The research team involved lecturers from the faculty of Applied and Computer Sciences from both campuses. The researcher directed the case study at the Vanderbijlpark main campus this way to equip learners with computer competencies at the start of a semester.

The Process of Project Design and Management (Figure-8) Model (Zuber-Skerritt, 2000:43) has been applied to create the vision, to determine strengths, weaknesses, opportunities, threats (SWOT), as well as implications, and to analyse the contents before planning the improvement of the practices. The figure-8 model emphasises the importance of creating a vision and analysing the context, formulation of the research problem(s) or focal question(s) before planning the improvement of practice, and embarking upon premature action planning.

1.5.3.1 Target population

The case study involved all 72 first-year learners enrolled for the National Diploma in Food and Beverage Management (F&BM) in the Department: Food. The research team developed and implemented a block module for EUC, comprising of 60 notional hours and a total of 6 credits, which was scheduled full-day, over two weeks, at the start of the first semester of 2001. In the South African context, a credit is defined in terms of the amount of learning expressed in numerical points in relation to the level of learning. Notional time refers to the average time that an average learner spends on achieving the outcomes for the module (SAQA, 2000:3).

The researcher was restricted to the use of only one computer laboratory equipped with 48 microcomputers. Therefore, the group was divided into one group of 45 learners, who attended the block module, and another group of 27 learners, who attended the traditional semester course. The module addresses the specified outcomes as published in the preliminary registered qualification document for the Diploma in F&BM (NQF 5).

1.5.4 Empirical study

Based on the information gathered through the literature review, questionnaires have been developed with the purpose of gathering information on the presentation of the EUC module providing answers to the research questions.

The entire group of 72 learners completed an open-ended questionnaire (Appendix A) during an information session, allowing them to act spontaneously upon the questions and to raise their expectations and concerns before the start of the module.

Open-ended questions and scales were used to measure the attitudes of the 45 learners, who attended the block module (Appendix B) after the completion of the module. Scales were used to measure the attitudes of learners from both groups at the end of the semester, in order for the researcher to determine attitudes towards the traditional and modular curricula (Appendix C).

Structured interviews were held with all the lecturers involved in the learners' education and training, in order for the researcher to determine the success of integrating computer competencies in other subjects or modules (Appendix D).

1.5.4.1 Data analysis

The Statistical Consultant Service of the Potchefstroom University had been consulted, for the acquisition of statistical analysis of the questionnaires, as well as information on suitable descriptive statistics.

1.6 STRUCTURE OF THIS RESEARCH REPORT

The researcher investigated and reported on the research questions by means of three articles. The advantage of submitting articles for publication during candidature, is that it conceptually integrates research, demonstration of originality and significance of the research. A researcher is thus already being trained for the publication phase during enrolment. Publication provides external quality control through reviewers' comments and suggestions, helping both the supervisor and the researcher (Sadler, 1998:125).

The objective of the first article (Chapter 2) entitled, 'The Development of a Modularised Curriculum for the Discipline End-user Computing: Implications in Practice', is to outline the EUC module and to reflect on the implications that the implementation of the module had on the curriculum.

In the second article (Chapter 3) entitled, 'Integrating technology, action research and experiential learning towards fostering learning in accelerated computer competency courses', the researcher reports on the development and implementation of a learning/teaching strategy for computer competency modules, in order to improve learning during accelerated learning modules or short courses.

The objective with the third article (Chapter 4) entitled, 'Conflicts in assessment with regard to integration and fragmentation in designing a module for End-user Computing', is to show that assessment within the EUC module, which is integrated with and assessed during the learners' other learning experiences, offers computer competency learners optimal learning experience.

In Chapter 5 the findings, conclusions and recommendations are presented with reference to each article, as well as a recapitulation of the findings for the complete research project.

1.7 SUMMARY

In this chapter, the problem was stated, and the objectives and significance of the research were argued. The reader was introduced to the research methodology, as well as the structure of this research report.

NOTE

This research report is presented by means of three articles. It is important to note that each of the above-mentioned articles should form a distinct entity and should not overlap in context. Therefore, each individual article's bibliography forms part of the article and is placed at the end of each chapter. Similarly, the bibliography for the first and last chapters, are also placed at the end of those chapters. The articles do not logically link to each other like chapters in a book, and the reader should see overlapping, repetition, lack of cross-references and the difference in argumentation between chapters in the context of the structure of this research report. However, a logical connection between the objectives of the research project as stated in Chapter 1, between each article (Chapters 2 - 4), and the conclusions, are made in the final chapter (Chapter 5). A complete bibliography is provided at the end of the dissertation.

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CHAPTER 2

THE DEVELOPMENT OF A MODULARISED CURRICULUM FOR THE DISCIPLINE END-USER COMPUTING: IMPLICATIONS IN PRACTICE

ABSTRACT

The White Paper on Higher Education and Training (SA, 1997c) states, that higher education should meet the needs of an increasingly technologically oriented economy. Graduates should be equipped with computer literacy, information management and problem-solving competencies in order for them to function in modern society. The Department of Computer End-using at the Vaal Triangle Technikon offers computer competency courses over one semester to learners from different departments at the Technikon. Lecturers have experienced a need to equip learners with computer competencies before they approach their learning experiences in their first year of study at the Technikon. A modular curriculum for the discipline End-user Computing satisfying outcomes-based education principles, was developed and implemented. The module comprises of 60 notional hours and was scheduled at the start of three consequent semesters. This article outlines the module and reflects on the implications that the implementation of the module has had on the curriculum.

2.1 INTRODUCTION

Higher education in South Africa is confronted with the challenge to contribute to the development of a 'knowledge society' in order to meet the needs of an increasingly technologically oriented economy (SA, 1997c:10). The Higher Education Act (SA, 1997d) has as its purpose, the transformation of the higher education system that is both programme- and outcomes-based in order to provide optimal opportunities for

learning and to overcome inequality and inefficiency. More recently, the Council on Higher Education (CHE, 2001:14–21) states that graduates should be equipped with generic skills (such as IT skills), as well as the ability to put these skills into action in order to contribute to a productive workforce and participation within the global economy.

The increase in the complexity of the training and the work environment requires from all learners and employees to use computer technology in order to find, analyse, manage and integrate information. Thus, there is a need for learners to become computer competent as soon as possible, in order to allow them to integrate the knowledge and skills in their respective academic programmes and thereby, to approach their careers successfully.

2.1.1 A challenge for curriculum change

The Department of Computer End-using (DCEU) at the Vaal Triangle Technikon, (VTT) offers several computer competency courses scheduled over one semester to learners from different faculties at the main and different satellite campuses of the VTT. Traditionally, assessment takes place in semester cycles and conventional administrative processes prescribe the timetable. However, in an outcomes-based education and training (OBET) system, curriculum designers are challenged to organise the curriculum around the successful achievement of outcomes, rather than around the duration of a course and traditional calendar-driven programmes (Spady & Marshall, 1991:68-69). Concurrent with national, social and economical needs, lecturers at the DCEU of the VTT have developed an outcomes-based modular curriculum for the discipline End-user Computing (EUC), to be scheduled at the start of a semester, in order to equip learners as soon as possible with the appropriate knowledge, skills and attitudes.

Traditionally learners, who enrolled for EUC, were assessed continuously throughout the semester by means of three practical summative assessments at the end of each one of these units. There were no re-write opportunities for this course at the VTT.

EUC was presented only once per year and learners who 'failed', had to repeat the course in their second year of study. The researcher was challenged to implement an outcomes-based modularised curriculum in which learners are provided more assessment opportunities and are assessed on a continuous basis by means of both summative and formative assessments.

A research project named Action Research on Computer End-using (ARCEU) was conducted by means of two case studies, one at the East Rand satellite campus and the other at the Vanderbijlpark main campus during the period 2000 – 2002. The research team involved lecturers from the faculty of Applied and Computer Sciences from both campuses. The module was scheduled over two weeks, commencing at the start of each semester. This article focuses on the implications that the implementation of the module had at the Vanderbijlpark campus.

2.2 DESIGN OF A MODULAR OUTCOMES-BASED EUC CURRICULUM

At the VTT the Department: Food was already in the process of revising preliminary registration documents to be submitted to SAQA for the qualification in Food and Beverage Management (F&BM). Lecturers in this department also shared the need to present EUC at the start of the learners' first semester at the Technikon. These lecturers and lecturers in the Department: Food collaboratively determined the purpose of the module, learning outcomes, assessment criteria, assessment methods and credits for this module. The module contributes towards the following exit level outcome, as stated in the qualification registration document:

- The qualifying person will be able to effectively use various modes of accessing and communicating information, including industry specific Information Technology, in order to promote the Hospitality industry within a changing business environment.

In designing the module, the researcher followed a top-down curriculum development approach (Cooke & Dinkelmann, 2001:14), in which the starting point

was the exit level and specific outcomes that have been established for the whole qualification.

2.2.1 EUC as a modular curriculum

A module is defined as the division of content into self-contained units of learning designed to satisfy one or more learning outcomes, and can be assessed (Du Pré, 2000:42; Young, 1995:169; Raffe, 1994:141). It includes pre-assessment, more continuous assessment opportunities and credit accumulation. Module duration or width is the time over which a module is offered. A block course is a module presented over a compact period of time, for example two weeks full-time after which the module is evaluated and considered as its being completed (Cooke & Dinkelmann, 2001:8). The EUC module was scheduled for two weeks during February 2001 before the commencement of the learners' other courses.

2.2.2 EUC as a foundational module

Within any learning programme or course, a module is usually designated foundational (providing the foundation for further learning), core (compulsory), or elective (selected from a prescribed range of modules) (Du Pré, 2000:42). Over the past twenty years, countries identified key competencies (Australia), essential skills (New Zealand), core skills (United Kingdom), workplace expertise (United States of America) (Harris, Gutrie, Hobart & Lundberg, 1995:47), and critical skills (SA, 1995), of which the acquisition of technological skills is imperative. Because of the foundational characteristics of a computer competency course, namely to provide the technical skills and knowledge required by business and industry, the EUC module is designated as a foundational module (EUC Forum, 2001).

In the following paragraphs the formulation of specific outcomes and their related assessment criteria are discussed, and the rationale for the time, credit and module duration for the EUC curriculum is argued.

2.3 AN OUTCOMES-BASED APPROACH TO CURRICULUM DEVELOPMENT

Prawat (1992:383) states that curriculum development within an outcomes-based model starts with the formulation of learning outcomes. Killen (1997:30) remarks that once "... they have been defined, the outcomes will influence each other in much the same way as they do in other curricula".

2.3.1 The integration of critical and developmental outcomes

Critical and developmental outcomes are generic and cross-curricular outcomes embedded in the whole learning programme and inform all learning and teaching (SAQA, 2000a, Du Pré, 2000:30, SA, 1997a:2). Seven critical and five developmental outcomes were approved by SAQA to direct educational activities towards the development of learners within a social, economical and political environment. These broad outcomes should have a positive influence in learners' lives, in order to enable them to apply skills, knowledge and values in new situations (SA, 1997a: 2). The following are examples of activities in the EUC curriculum that extensively integrate the critical and developmental outcomes:

- the effective use of technology;
- demonstration of the world as a set of related systems through the integration of knowledge and skills in different contexts;
- reflecting on different strategies to learn effectively;
- problem-solving skills; and
- collaboration between learners and departments.

2.3.2 The formulation of specific learning outcomes for the EUC module

Technikons follow the route of designing modules that form the building blocks of non-unit standards based academic or 'whole' qualifications (Du Preez, 2001:17; Genis, 2000:2). Unit standards are nationally agreed and internationally comparable

learning outcomes and with their associated assessment criteria, form the building blocks of the NQF (SA, 1997a:3). However, the outcomes of a computer competency module should be in line with the National Unit Standards, submitted by the Information Systems and Technology Standard Generating Body (IS & T SGB), in order to ensure articulation and international competency (End-user Computing Forum, 2001). The specific outcomes for the EUC module are linked with 12 of the 15 EUC unit standards registered on the NQF (SAQA, 2000).

Specific outcomes focus on what the learner will be able to do at the end of a specific learning programme. In a module, detailed outcomes (range statements and performance indicators) guide the choice of learning, teaching, and assessment strategies. Effectively formulated outcomes are achievable and assessable (indicated by assessment criteria). These items communicate module expectations to the learner and should be stated in a language that the learner would understand (Walker, 1994:5-7).

The detail in which specific outcomes are formulated within a specific context and at a certain level, in which they are to be demonstrated, is crucial if assessment is to be transparent, fair and effective (SA, 1997a:3). The specific outcomes are supported by assessment criteria that define broad observable processes as evidence of the achievement of the specific outcome (SA, 1997b:13). Assessment criteria for the EUC module were rephrased in the module document in order to ensure the integration of computer competencies in the learning programme. Table 2.1 lists the specific outcomes and assessment criteria for the EUC module for the qualification in F&BM (NQF 5).

Table 2.1 Specific outcomes and assessment criteria of the EUC module for Food and Beverage Management

Specific outcomes (SO's)	Assessment criteria
1. Identify the need for and type of information, access information and organise information.	Electronic information sources should be used to find, access, create and use information.
2. Understand the role of computer hardware and software in the Hospitality Industry.	The major categories of software should be used to integrate applications software in the Hospitality Industry. Examples of commonly used software and its applications in the Hospitality Industry should be addressed.
3. Organise information using a computerised system.	An operating system, word processor and spreadsheet, should be applied to create, edit and save documents.

2.3.3 Performance indicators and range statements for the learning outcomes

Performance indicators break down the specific outcomes into essential stages to be reached in the process of achieving the outcomes. It also ensures that learners have formed the necessary opinions and values through their learning in order for them to apply their learning in practice (SA, 1997b:17). Because the assessment criteria provide only broad indications of what evidence learners need to present, there is a need to provide much more detailed information about what learners should know and be able to do in order for them to achieve the outcomes. Therefore, the assessment criteria are explained and detailed in the range statements (SA, 1997b:13).

Range statements and performance indicators for the module are listed in Table 2.2 and describe the evidence that the learner should provide at the end of the learning experience. Note that the verbs used in the EUC module, reflect the cognitive, affective and psychomotor outcomes of Gagné's and Bloom's taxonomies (Van der

Horst & McDonald, 1997:37-38, Posner, 1995 & Gagné, 1985). The formulation of outcomes attempts to answer the questions listed below.

- Cognitive: How can learners learn to make sense of the world and to think more intellectually, productively and creatively?
- Psychomotor: At the completion of the module, what should the learners be able to do? This includes, i.e. the handling of input, output and storage devices.
- Affective: What experiences will lead to the healthy growth of the individual and what attitudes should be encouraged in order for learners to succeed?

2.3.4 Time, credit and module duration

Slattery (1995:233) views the post-modern curriculum as a complex, multidimensional, interdisciplinary system. He states, "... a vision of curriculum development from the perspective of the new sciences can create a paradigm shift in our educational practices that will replace the linear, objective, and time management models that have dominated our thinking" (Slattery, 1995:231).

The difficulty associated with using 'real' time, such as contact time, as the basis for a block module was partly solved by the theoretical construct of 'notional time'. In its simplest sense notional time is all the time an 'average' learner spends while learning, including contact time, self-directed learning, projects and assignments (Cooke, 2001:56). Credit, together with accumulation and transfer, suggests that learning can be measured and can take place anywhere. The EUC module carries six credits or 60 notional hours when presented at NQF level 5. Table 2.3 shows how notional hours have been calculated.

Table 2.2 Performance indicators and range statements for the EUC module for Food and Beverage Management

Performance indicators	Range statements
<p>The qualifying learner should be able to perform the following:</p> <p>1. Understand the different parts of an information system (SO 1, 2).</p>	<p>Evidence that the qualifying learner should provide.</p> <p>1.1 The different parts of an information system should be listed.</p> <p>1.2 Basic Information Technology (IT) concepts should be defined.</p> <p>1.3 Functions of different hardware components of a microcomputer should be described.</p> <p>1.4 Examples of commonly used functions of a microcomputer in the hospitality industry should be discussed.</p>
<p>2. Operate the different parts of a microcomputer successfully (SO 1).</p>	<p>2.1 Different storage media should be handled correctly and carefully.</p> <p>2.2 Input media should be handled in order to enter data and instructions.</p>
<p>3. Use an operating system to manage files and operate the most important components of the personal computer (SO 3).</p>	<p>3.1 The operating system should be used to operate effectively within the desktop environment.</p> <p>3.2 Files and folders should be manipulated successfully using filing operations.</p> <p>3.3 Information should be stored and retrieved.</p>
<p>4. Apply word processing functions to create and format a word processing document ready for distribution (SO 3).</p>	<p>4.1 Print-ready word processing documents must be created using filing, editing, viewing, inserting, formatting and tabling functions of a word processor.</p>
<p>5. Use a spreadsheet to accomplish standard mathematical and logical operations through basic formulas and functions (SO 3).</p>	<p>5.1 Mathematical, logical and statistical operations must be done successfully by using basic editing, inserting and formatting functions to manipulate data on a spreadsheet.</p> <p>5.2 Spreadsheets should be used to produce information typically required in the hospitality industry.</p>
<p>6. Integrate software (SO 2, 3).</p>	<p>6.1 Application software and the operating system should be integrated to create useful documents in the hospitality industry.</p>

Table 2.3 Calculation of notional hours and credits for the EUC module

	Learning/teaching activity	Notional hours
A	Contact time	
	Whole group facilitation: introduction, lectures, or presentations	7
	Practical application of skills in a microcomputer laboratory	15
	Guided instruction: step-by-step demonstrations using network-broadcasting program (Net-Op School)	10
B	Assessment	
	Informal formative, including self- and peer-assessment during exercises	11
	Summative assessment	4
C	Non-contact time	
	Practice on own and after-hours in microcomputer laboratories	9
	Self-directed learning: memorising, note-making, note-taking, assignments, or reading	2
	Assessment preparation and revision	2
D	Sub-total: Contact and assessment time	47
E	Sub-total: Non-contact time	13
F	Number of notional hours required to complete the module (D + E)	60
	Number of credits (10 Notional Hours = 1 Credit) (F/10)	6

Module duration or length may vary. The length of a module is not determined arbitrarily, but is the result of a careful analysis of the curriculum or learning outcomes (Theodossin, 1986: 135). Theoretical and practical modules for example, may be presented parallel over longer intervals (Figure 2.1) in order to ensure integration, accommodate more groups of learners, or implement more effective assessment strategies. Alternatively, consecutive modules can be repeated more often over one year (Figure 2.2) in order to provide more assessment opportunities, faster progress, or more entry and exit points. The notional hours of the EUC module were scheduled full-time over two weeks.

A Practical module



B Theoretical module



Figure 2.1 Theoretical and practical modules presented parallel for several groups over longer periods

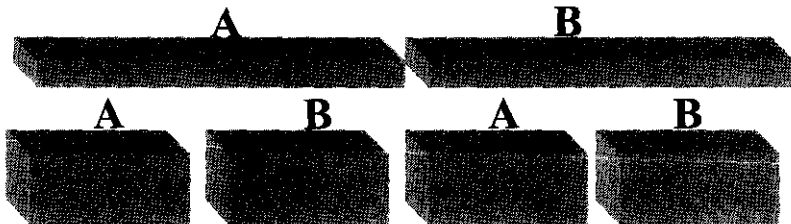


Figure 2.2 Block modules that represent theoretical modules (A) or practical modules (B) scheduled repeatedly during one year

Time is the most important factor to take into account to schedule a module full-time at the start of a semester. At the East Rand Campus the block module was scheduled consecutively for two weeks throughout the first semester (Buis, C. & Janse van Rensburg, G., 2001:111). Because the East Rand campus presents only a limited number of learning programmes, there were only a few groups that were small enough to be scheduled successfully without disrupting the presentation of other subjects.

This was not the case at the Vanderbijlpark campus. A total of 72 learners enrolled for the qualification in F&BM and had to be divided into two groups, since the microcomputer laboratories are equipped with a maximum of 48 microcomputers. Because all the other laboratories and lecturers of the DCEU were required to present computer competency subjects for other departments scheduled over the semester, the DCEU could reserve only one laboratory and one lecturer for the case study. During an information session before the classes commenced, the learners were informed, that only the first 45 learners who enrolled for EUC, would follow the block module, while 27 learners would attend the traditional course with traditional teaching methods scheduled over the semester.

2.4 RESEARCH QUESTION

With this module design in mind, the researcher wanted to find an answer to the following research question.

- To what extent can the implementation of a modularised EUC curriculum improve learning and capability, and what lessons can be learned regarding the effects thereof?

2.5 RESEARCH DESIGN

The research design can be characterised as post-positivistic, qualitative action research. In contrast to a positivistic quantitative research, a qualitative paradigm is holistic in nature and the main aim is, to understand particular social realities (De Vos, 1998). Interpretative educational research provides individuals with an opportunity to reconsider beliefs and attitudes inherent in their existing ways of thinking (Carr & Kemmis, 1986:91). Perceptions of practices, such as the traditional offering of a curriculum, are changed by changing the ways in which they are understood. Elliott (1991:69), and Kemmis and McTaggart (1988:6) define action

research as the collaborative study of a social situation, such as education, with the aim to improve the quality of action within that situation.

Action research provides the research team with a framework in which they could investigate the modularisation of EUC, solve practical problems as they occurred and improve their educational practices at the VTT. It provides a means to increase knowledge about the curriculum and to learn from the consequences of the changes (Kemmis & McTaggart 1988:6). The research team developed and implemented a modular curriculum for EUC over three subsequent semesters by following the basic cycles of action research activities, as interpreted by Kemmis & McTaggart (1988), Elliott (1991) and Zuber-Skerritt (1992).

The researcher attempted to gain a first-hand holistic understanding of learners' and lecturers' views, experience and needs. Data collection was shaped as the research proceeded through several cycles. Ertmer (1997:169) defines data triangulation as attempts to gather observations using a variety of sampling strategies to ensure that a theory is tested in more than one way. Data was obtained from questionnaires, structured and unstructured interviews and assessment results.

After identifying a thematic concern, the research team engaged in cycles of reconnaissance, planning, implementing action plans, observing and reflecting, as discussed in the following paragraph.

2.6 IMPLEMENTATION OF THE MODULARISED EUC CURRICULUM

After investigating the need for EUC in the higher education situation, the researcher applied the characteristics for a dynamic curriculum design process, as described by Carl (1995:84-85). In summary, it comprises involving multidisciplinary stakeholders at different levels or sectors of planning and recognising the strong influence of the variables that shape the curriculum.

Different phases of the project emerged as the research progressed through the action research cycles, of which the following involved the case study at the Vanderbijlpark campus.

2.6.1 Planning and design: July 2000 – January 2001

- Do strategic planning for the case study.
- Design the curriculum.
- Determine the Target Group: learners enrolled for a qualification in F&BM.
- Inform and prepare all stakeholders for the envisaged change. Determine the needs and concerns of the Target Group.

2.6.2 Implementation: Vanderbijlpark campus, January 2001

- Implement the block module for 45 of the 72 learners.
- Continue with a traditional semester course for the remaining 27 learners.
- Observe the implications of implementing the block module.
- Cultivate an awareness and interest in the case study. Present the results to Senate and Committee for Tutorial Matters (CTM) during 2001.

2.6.3 National discussions

- Hold a National EUC forum at Afprod Place to discuss modularisation of EUC on national level (EUC Forum, 2001).
- Evaluate the case study.
- Document all aspects of the curriculum.

2.6.4 Continuous development

- Decide in collaboration with management whether the block module is accepted or rejected.

- Curriculum development is regarded as an on-going process through continuous discussion, and the module is revised.
- Lecturers at different campuses have the opportunity to adapt the learning/teaching situation to local circumstances.

These phases correspond with the phases that Carl (1995:147) proposes regarding a strategy for the dissemination of a curriculum. Carl (1995:95) provides a frame of reference for curriculum design that has as its starting point, the goals of the curriculum. There is a dynamic (and not linear) interaction between the components, as well as a close relationship and flexibility between them. It is important to describe the key concepts of the frame of reference, since it formed the basis for the design and implementation of the module. In the following section, the authors will describe the implementation of the EUC module within this framework.

2.7 FINDINGS AND DISCUSSIONS

2.7.1 Scheduling of the module

All 72 learners attended an information session at the start of the semester, where they had to write down their expectations and concerns about the schedule of the block module over two weeks by means of an open-ended questionnaire. Figure 2.3 indicates that only a few learners were concerned, that two weeks would be insufficient to get enough practice.

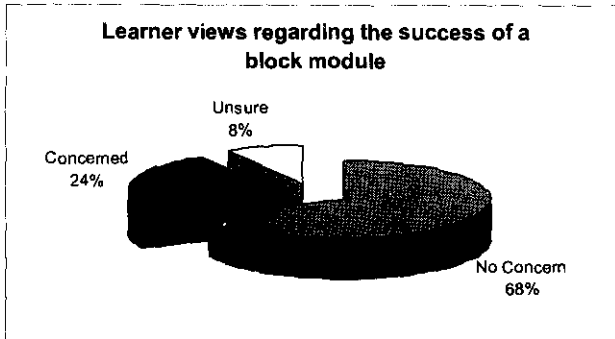


Figure 2.3 Concerns of the whole group before classes started

Scheduling the module over two weeks, had practical implications, because one lecturer, a laboratory and an auditorium were taken out of the normal schedule for the purpose of the case study, while all other subjects were presented over a semester. As an effect, some modules in the Department: Food, started two weeks later, and teachers did not re-schedule their work according to the new academic timetable.

Time was a restrictive factor during the presentation of the block module and had to be managed rigorously. Careful planning of daily activities allowed time for reflection and re-planning for the next day, while learners were engaged in non-contact activities. Notional hours proved to be realistic. All the outcomes were met and the learning content was covered.

During reflection on the last day of the block module, 63% of the learners indicated that they were satisfied, had enjoyed the course and had worked through sufficient examples. They believed that they would remember the work. A smaller group of learners felt that it would be better to do this module parallel with other modules and that they needed more time for practice. Three learners said that the pace was too fast and strenuous; they did not understand the work and did not get enough help in

order to succeed. This indicates that not all learners are able to learn under intensive conditions. The results are summarised in Figure 2.4.

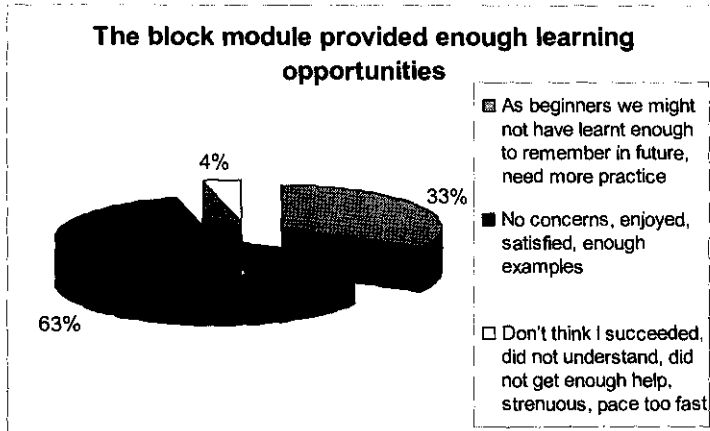


Figure 2.4 Learner views regarding accelerated learning

Breaking up the curriculum into modules provides only, at best, half the answer to the question of curriculum organisation (Young, 1995:178). The academic timetable will have to be centrally designed in order to enable the flexibility it requires. What is needed is a new form of a systems approach, that links modules and outcomes explicitly to overall purposes (Young, 1995:178). The same module may be scheduled differently for various departments, or for different learners, e.g. those who repeat the module, or for those who do not have any computer skills at all. It also provides for the recognition of prior learning of those who are already computer competent, by means of pre-assessments.

2.7.2 Selection and integration of the learning content

Selection, classification and sequencing of content are principal curriculum functions. It comprises responsible selection of content relevant to learners' needs, which correspond with the outcomes to be mastered. Knowledge of Information Technology enables learners to understand how a computer system works and

where it fits into the world, and to enable them to manage and function meaningfully in an information system environment.

Existing learning content was evaluated in the light of the rapid development in the field of technology, as well as the increasing need for computer competency. Unit standards for EUC (SAQA, 2000), as well as international standards, for example that of the European Computer Drivers' Licence (ECDL) (The ECDL Foundation, 2001), were considered when outcomes were formulated. Learning content was selected accordingly.

While there is presently an enormous explosion of knowledge in the IT field, as well as an abundance of software, careful selection should be done to what contains the highest priority value for the learner's future working life. National and international needs and preferences regarding microcomputer software are considered. Software programs in the microcomputer laboratories are regularly upgraded, in order to meet the needs of the computer society.

A workbook divided into four units, namely basic concepts of IT, using the computer and managing files, word processing, and spreadsheets, forms the basis of the learning content. It contains detailed outcomes that correspond closely with the performance indicators and range statements of the module. The workbook comprises concepts, examples, exercises and self-assessments. Examples from the Food and Beverage Industry were used in order to guide learners to integrate their knowledge and skills in their learning programme. Demonstration of concepts, exercises and assessments were based on these examples.

The learners' capability to integrate computer competencies in other modules, were assessed through interviews with four lecturers in the Department: Food. Two lecturers expected from both groups to integrate their word-processing skills by handing in typed assignments during the specific semester. The semester group also commenced with word processing skills by the time they had to start working on the assignments. Lecturers observed that learners who attended the block module

were keen to help those who did not have enough skills yet and the quality of the assignments was considerably better than that of the previous year. All four lecturers are of the opinion that learners fail to remember their computer skills if they are not expected to hand in typed work throughout the learning programme. They suggested that hand-written assignments should be rejected. Lecturers in the Department: Food, indicated that they want to be more effectively involved in planning the learning content of their learners' EUC curriculum.

2.7.3 Mastering of the learning outcomes

Learners from both groups completed a questionnaire at the end of the semester. Figure 2.5 indicates the learners' views on their ability to apply computer skills in order for them to type assignments during the first semester.

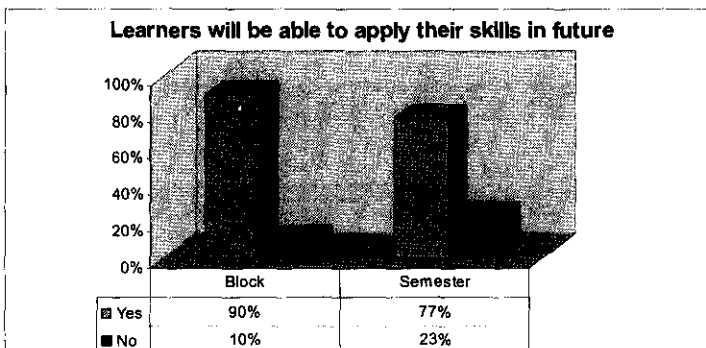


Figure 2.5 Learner views on retention at the end of the semester

Expecting from learners to hand in typed assignments is only reasonable, if they have access to microcomputer facilities. Microcomputer facilities are available after hours, but are used on a first-come, first-serve basis. More than 70% of both groups extensively used the laboratories after hours. The group, who attended the block module, used the laboratories during the two weeks to practise and prepare for assessments. During the rest of the semester, they used the laboratories to type assignments for other modules. Only 4% of all the learners said, that not enough

microcomputers were available. Nine learners, who attended the block module, had their own microcomputers at home.

2.7.4 Learning/teaching methods and teaching media

Learners should see learning activities as purposeful, useful and challenging, but achievable (Killen, 1997:27). In the outcomes-based learning paradigm, the power of the environment and methods in use is judged in terms of its impact on learning. It remains the responsibility of educators to construct meaningful learning experiences so that learners will be able to achieve the outcomes within the limitations of the two-week block module.

The network broadcasting application, Net-Op School, is used as part of the curriculum, so that the learners can observe, while concepts are explained. A learning strategy that incorporates experiential learning, as explained by Kolb (1984:21-22) and action learning, as explained by Revans (1987:11) and Pedler (1983:55), provides a framework in which newly acquired knowledge and concepts can be tested in practice. Learners can acquire knowledge, skills and values following a process of active search and enquiry, rather than passively absorbing what is being taught. In this sense, a constructive, participative approach to learning/teaching was used. At the end of each session, the learners reflected on their progress against the detailed outcomes in the workbook. The cyclical and reflective nature of both methods allows learners to continuously work on problems at their own pace and in collaboration with other learners, until they succeed.

2.7.5 Learner-orientated assessment

A pre-assessment in the form of a test that integrated all units, was introduced in order to give recognition to prior learning (RPL). Three learners did the pre-assessment and were successful. The learners nevertheless had to enrol for the module because the Technikon did not yet have an RPL system in place and the

learners could not provide evidence of any other courses that they completed successfully to gain credit for the EUC module.

In outcomes-based learning, learners' progress is measured against agreed criteria (learning outcomes). Learners, who do not meet the criteria, receive clear feedback that indicates areas that need further work, in order for them to reach the required standard. They are thus given support to try again. The concept of pass/fail is radically altered to credit/try again (SA, 1997b:38).

Although the EUC module is presented by means of four units, all the outcomes imply that an integrated approach should be followed in order to guide against fragmentation. Lecturers in the Department: Food suggested, that both they and EUC lecturers will in future assess the assignments and that the marks should contribute towards continuous assessment. Learners are expected to integrate knowledge and skills progressively in order for them to demonstrate their improvement, so that they are assessed on what they know and what they can do at a certain point in time.

A total of 89% of learners who attended the block module, were successful, while only 57% of learners who attended the semester course, were successful, probably due to the rigorous learning process and the fact that learners still retained what they have learned by the end of the two weeks.

The learners, who were successful during 2001, were again assessed on word processing and spreadsheets skills during February 2002. Importantly, the results indicated in Figure 2.6, show that learners remembered only what they practically had to integrate in assignments. No spreadsheet skills were required for the assignments.

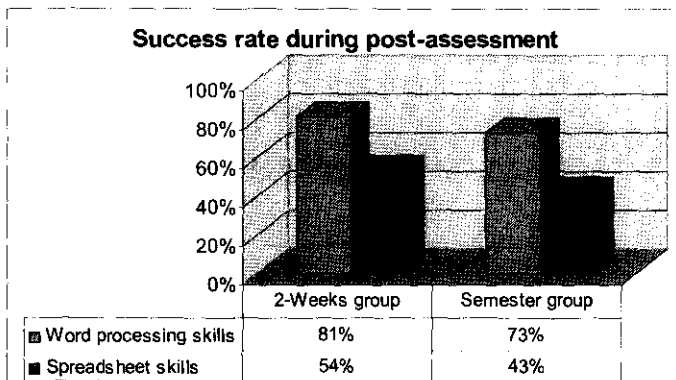


Figure 2.6 Retention skills at the start of the learners' second year

The assessment of this module clearly shows the dynamic interaction and relationship between and importance of each of the components of the curriculum (Carl, 1995:95). Checking own performance against outcomes in the workbook (self-assessment) to determine progress and arriving at conclusions about further actions, was further supported through the implementation of a reflective learning/teaching strategy.

Furthermore, the EUC module suggests an assessment strategy for a flexible, outcomes-based curriculum, in which learners do not have to only demonstrate mastery of skills, but also to demonstrate capability, employability and orientation in the workplace through the integration of knowledge and skills.

2.8 IMPLICATIONS OF THE MODULAR CURRICULUM FOR EUC: REFLECTIONS AND CONCLUSIONS

The curricular innovation of the ARCEU project took place within a matrix of educational, political, economical, institutional and administrative variables, which interacted and affected the eventual outcome of the project. The rationale

underlying the development of a block module for the subject EUC, was to provide learners with prior knowledge and to empower them to see computer competency in the context of their 'working community' in order for them to develop into responsible and competent users.

Positive results such as the following, revealed that learning could be improved within a block module.

- The high success rate and positive responses gathered from questionnaires, show that learners were open to learning in new ways and that there were sufficient formative assessment opportunities in the course of the block module.
- The average assessment results of learners, who attended the block module, exceeded that of the semester course learners.
- Learners were able to integrate computer skills in other learning experiences and retained those skills that they had to utilise for completing assignments.
- Clearly defined performance indicators and range statements provide lecturers with a freedom to present the module according to individual styles, while they have the assurance of quality control, in the sense that learners will achieve the outcomes and be able to integrate their knowledge and skills in their respective careers.

In addition to the above, the following valuable lessons were learned from the outcome of the case study.

- Because the module is presented to more than 20 other departments at the VTT, scheduling the module in smaller blocks than semesters or quarters, will remain a problem until all departments have abandoned the rule of time and fully modularised their qualifications.
- The philosophies of block modules are substantially different from traditional semester subjects and, therefore, there are potential barriers to successful implementation. The new modular structure requires from lecturers to adopt a

philosophy towards teaching and classroom management that differs from the conventional classroom style and they may not have made the paradigm shift to implement modern, outcomes-based teaching and assessment methods. It is, therefore, essential that they be trained in OBE competencies.

The EUC module may be adapted as a generic module and offered as a foundation course to all learners who enter the Technikon on the NQF level 5. The EUC module is in essence adopted as a generic computer competency module for the DCEU. It is recommended that further or advanced modules succeed the foundational module in order to satisfy specific needs of different departments. An advanced module on data bases, presentation and communication skills has indeed been implemented, for the qualification in F&BM on NQF level 6a during 2002.

Projects like these foster the development of an innovative professional culture among lecturers and encourage them to view curriculum work as an ongoing opportunity to experiment with new ideas and practices. The case study enables and motivates professionals to further develop their knowledge and understanding of what is involved in effecting curriculum and educational change.

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CHAPTER 3

INTEGRATING TECHNOLOGY, ACTION RESEARCH AND EXPERIENTIAL LEARNING TOWARDS FOSTERING LEARNING IN ACCELERATED COMPUTER COMPETENCY COURSES

ABSTRACT

Learners in higher education are expected to use Information Technology (IT) as a tool to search for, analyse, manage, and integrate information in their respective academic programmes. The challenge is to equip learners with computer competencies as soon as possible, so that they can integrate IT in all their learning experiences, while developing meta-cognitive and life-long IT skills. Furthermore, the Higher Education Act (101/1997) in South Africa (SA) has as its purpose, the transformation of higher education through the implementation of an outcomes-based education and training (OBET) system. The researcher conducted a case study during which a learning/teaching strategy for a computer competency module, which was scheduled over two weeks at the start of a semester, was developed. Action research and experiential learning was successfully combined with the Net-Op School broadcasting program so as to enable learners to observe and apply new concepts, as well as to reflect upon their learning processes within an accelerated learning context. Although different variables may influence the learning/teaching situation, it has been established, that this learning/teaching strategy can be successfully implemented in accelerated learning modules or short courses.

3.1 INTRODUCTION

In South Africa, the Higher Education Act (SA, 1997a) has as its purpose the transformation of the higher education system through the implementation of an outcomes-based education and training (OBET) system. Furthermore, the Strategic

Plan of the Vaal Triangle Technikon (2000:4) declares in its Mission Statement, that, "... the Vaal Triangle Technikon is committed to the development of higher education through excellence in teaching and learning by developing entrepreneurial, technological and cognitive skills". The Council on Higher Education (CHE, 2002:14-21) states that graduates should be equipped with generic skills (such as IT skills), as well as with the ability to put these skills into action in order to contribute towards a productive workforce and participation within the global economy. Thus, there is a need for learners to become computer competent as soon as possible, in order to allow them to integrate the knowledge and skills in their respective academic programmes and thereby, to approach their careers successfully.

In agreement with the national needs and the mission of the Technikon, lecturers in the Department of Computer End-using, conducted a case study during the period 2000 - 2001 to offer an accelerated computer competency module in order to provide learners with the necessary IT skills at the start of the academic year. The case study involved the development of a computer competency module, comprising of 60 notional hours, and presented to learners enrolled for the qualification in Food and Beverage Management in the Department: Food.

A module is a coherent self-contained unit of learning, designed to achieve a set of specific learning outcomes assessed within that unit of learning. Notional hours of learning refer to the estimated learning time for an average learner to meet the outcomes defined. It includes contact time and non-contact time, such as individual learning, as well as formative and summative assessment (SAQA, 2000; Du Pré, 2000:41-44). The 60 notional hours that were assigned to the module, were scheduled full day, over two weeks. A total of 45 learners attended the accelerated module, while 27 learners attended the traditional course with traditional teaching methods, scheduled over the whole semester.

The research team and lecturers in the Department: Food, formulated specific outcomes and assessment criteria that clearly communicate module expectations to learners. The research team agreed, that the learning process should be organised

in such a manner as to determine what is essential for all learners in order to enable them to succeed (Janse van Rensburg & Vermeulen, 2002:6). In the SA outcomes-based education (OBE) system, "... it remains the responsibility of educators to construct meaningful learning experiences that lead to the mastery of outcomes" (Cockburn, 1997:7). A basic part of constructing meaningful learning experiences for learners, is the selection of appropriate teaching methods and strategies. For learners to achieve the outcomes within the limitations of an accelerated module, the learners' opportunities to learn needed to be optimised.

This paper discusses the learning/teaching strategy developed to enhance learning in the computer competency module. The module was presented in a microcomputer laboratory, equipped with network broadcasting technology and software (Net-Op School), in order to demonstrate application software operations. The learning/teaching strategy has as its purpose, the incorporation of outcomes-based learning and teaching principles. Learners who attended the module, perceived the learning/teaching strategy as outcomes-based and 89% of the learners completed the module successfully.

The researcher combined the Lewinian 4-stage experiential learning (EL) model developed by Kolb (1984:21-22), and action research (AR) as explained by Zuber-Skerritt (1993:46-47), Kemmis & McTaggart (1988:8-10), and Elliott (1991:69-70), as the learning/teaching strategy for the module. Learning involves a process of discovery, problem solving, and experience and is most effective when learners are involved in their own learning processes. Learners acquire knowledge, skills, and values, following a process in which they observe, experiment, test solutions, reflect, and share findings, rather than their passively absorbing what is being taught. The cyclical and reflective nature of both methods, allows learners to work continuously on problems but at their own pace, and in collaboration with other learners, until they succeed.

In the following sections, the research objectives, design of the learning/teaching strategy and research methodology are discussed within the framework of cognitive

and constructivist learning theories. Subsequently, the implementation of the learning/teaching strategy is discussed, with specific reference to the roles of the learner and lecturer. The article concludes with a discussion of the research findings and reflections on the implications of the learning/teaching strategy in an accelerated learning context.

3.2 PROJECT OBJECTIVES

Learning/teaching strategies are chosen according to the outcomes, that is what learners should be able to do, because of the teaching. The design of the learning/teaching strategy was motivated by the need to provide learners with computer competencies as soon as possible after commencement of their first year of study at the Technikon. Since knowledge and skills are often associated only with 'facts' or 'operational capabilities', the authors refer to competencies, which implies knowledge, skills, as well as attitudes.

The learning/teaching strategy has as its purpose the incorporation of outcomes-based learning and teaching principles in order to promote a shift from a teaching paradigm to a learning paradigm. It is the belief of the researcher, that the value in teaching is in the learning it fosters and teaching and learning form a single integrated concept.

In the design of the learning/teaching strategy, the researcher was challenged to find an answer to the following question.

- Which didactic strategies can be implemented to ensure that learners will achieve and remember the learning outcomes in an accelerated computer competency module, and how can current theory be applied to solve the problem?

3.3 DESIGN OF THE LEARNING/TEACHING STRATEGY

3.3.1 The teaching/learning (didactic) situation

In this section, the design of the learning/teaching strategy is discussed, with reference to the specific didactic situation in which learners and the lecturer communicate with each other by means of the learning content in a microcomputer laboratory. From this interaction, learners construct their own meanings by integrating new knowledge into their existing cognitive structure (prior knowledge).

The structure in Figure 3.1, adapted from Duminy & Söhnge (1987:6); Steyn (1988:160); Fraser, Loubser & Van Rooy (1993:100); Drinkwater & Nieuwoudt (1998:21), and Vermeulen, (1998:8), indicates the dynamic interaction between the learner, lecturer and the learning content. The sides of the didactic triad represent the interactive and unique relationships that exist between the constituent components of the didactic situation (1-3) while the other related components of the didactic situation, interact in a particular way with the components of this triangle (4-7). These components are subsequently discussed.

3.3.1.1 Learners

Learners bring along their own knowledge, skills, and attitudes from previous educational encounters. Recognition of prior learning (RPL) was implemented, in the sense that learners could prove and display their mastery of the relevant outcomes and by that, obtain credit for the module. Lecturers should pay close attention to learners' conceptions regarding subject matter, their conceptions of what learning is, and how they learn. For example, cultural differences can affect learners' comfort levels in working collaboratively, rather than individually, and are reflected in the background knowledge learners bring to a new learning situation (Laurillard, 1993:214). Learners should be allowed to become actively involved in the learning

process and to 'take the floor' under the guiding and facilitating care of the lecturer (Niewoudt & Baxter, 1996:185).

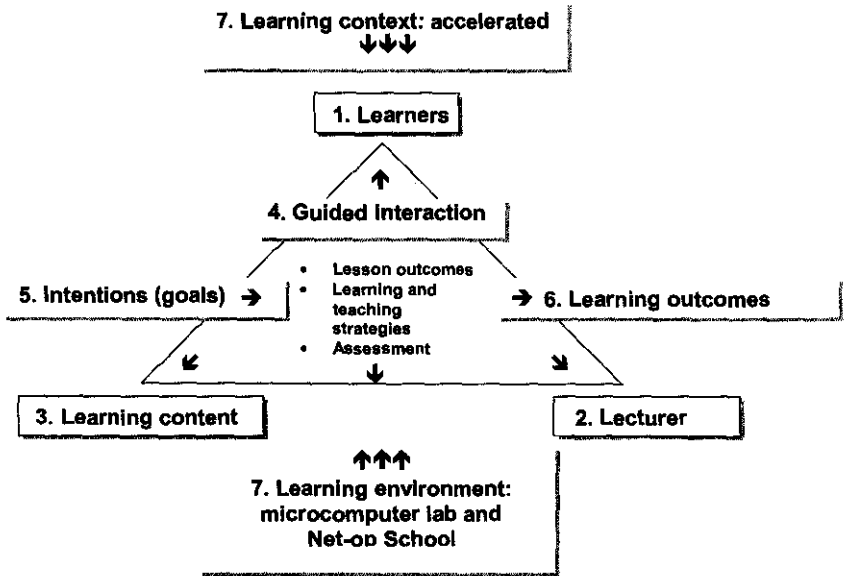


Figure 3.1 The dynamic interaction between the learner, lecturer and learning content, as adapted from Duminy & Söhnge (1987:6); Steyn (1988:160); Fraser, Loubser & Van Rooy (1993:100); Drinkwater & Niewoudt (1998:21); and Vermeulen (1998:8)

3.3.1.2 The lecturer

The cognitive-oriented lecturer is an active participant in the learner-lecturer-learning content relationship and works in close contact with the learners. The lecturer is aware of the learners' conceptual basis and learning styles, in order to help the learners to understand the concepts that are taught (Hergenbahn & Olson, 1997:450).

The success of teaching in an accelerated environment, lies in the learner's positive belief in the lecturer, while lecturers must believe in the virtually unlimited capacity of the learner as a social being (Meier, 2000:xvii). Positive emotions, such as care, understanding and commitment, influence the effectiveness of the learning process, enhance retention, and are established through a friendly, relaxed and joyful tone (McNiff, 1993:60; Meier, 2000:14; Rose & Nicholl, 1997:50).

3.3.1.3 Learning content

Learning content is the means for teaching learners in order to achieve the outcomes of the curriculum. The microcomputers in the laboratory are equipped with contemporary software, e.g. Microsoft Office, that is required by the IT society, and that will contribute meaningfully towards achieving the outcomes. Each learner had a workbook containing detailed outcomes, definitions of concepts, examples, exercises, and self-assessments. The learning content was integrated with specific examples from the Food and Beverage industry, in order for learners to acquire more applicable and specific academic, social and vocational skills, and not only generic computer skills.

3.3.1.4 Guided interaction

Some degree of guidance (or facilitation) is necessary for most learners, in order for them to make their activities productive and purposeful. Vygotsky (1989) proposed the concept of a zone of proximal development as the area where the learner cannot solve a problem alone, but can be successful under lecturer guidance or in collaboration with a more advanced peer. This is the area where learners in challenging situations can develop their own thinking abilities through timely, appropriate explanations, demonstrations and support called scaffolding, from lecturers or peers. Assisted learning is the process of providing appropriate scaffolding within the learner's zone of proximal development.

Sometimes the best lecturer is another learner who has just figured out the problem and is probably operating within the same zone of proximal development (Vygotsky, 1989:86; Woolfolk, 1995:51; McCown, Driscoll & Roop, 1996:44). Both Piaget and Vygotsky believed, that learners' interactions with peers are an important source of cognitive development. Vygotsky (as quoted by McCown et al., 1996:57), described two goals of peer interaction namely:

- firstly by confronting the views of others and approaching an issue from various perspectives; and
- secondly, by expressing and defending their own understandings and beliefs.

When learners explain or demonstrate their plans of actions to each other in their own language, it is more likely that their plans will reflect comprehension, and that those plans will be understood by the peer (Ashman & Conway, 1993:85; Biehler & Snowman, 1997). Peers can stimulate thinking, raise questions, and constitute an ordinary part in the process of knowledge construction. Importantly, by exchanging ideas, learners discover that there are multiple solutions to a problem. Moreover, co-operative learning and group discussions support the learning and teaching methods prescribed by OBE.

3.3.1.5 Goals

In the OBE context, critical and developmental outcomes, such as problem solving, critical and creative thinking, the use of technology, communication and collaboration, are broad statements that are embedded in the learning outcomes and describe the purpose of education and give the curriculum purpose and direction. These also describe the kind of citizen that education and training system should aim to produce (SA, 1997b).

3.3.1.6 Learning outcomes

Teaching and learning are intentional activities, with a particular outcome in mind. Learners need a clear idea what the purpose of the module is and what they will be

able to do (or to be) consequently. The computer competency module for learners in Food and Beverage Management contributes towards the following exit level outcome, stated as follows in the qualification registration document.

- The qualifying person will be able to effectively use various modes of accessing and communicating information, including industry specific Information Technology, in order to promote the Hospitality industry within a changing business environment.

3.3.1.7 The learning context and environment

Learning and teaching take place within a specific context and environment. This environment brings together all activities into a harmonious flow, and should offer adequate support for the learner, in order for learning to take place effectively. The learning/teaching strategy focuses on teaching computer competencies within an accelerated learning context, in a microcomputer laboratory, using the Net-Op School broadcasting program to demonstrate application software operations visually, and using English as the language of learning.

Accelerated learning (AL) is a systematic approach to teach the whole person in a short period and contains specific core elements that empower learners to learn faster, more effectively and joyfully. It is directed at involving the abilities of the whole brain in learning (Meier, 2000:33-49; Rose & Nicholl, 1997:18-43). According to Meier (2000:9-10), AL is founded on the following principles:

- learning involves the whole mind and body;
- the image brain absorbs information instantly and automatically;
- learning is creation, not consumption;
- collaboration promotes learning;
- learning takes simultaneously place on many levels;
- learning comes from doing the work itself, with feedback; and

- positive emotions greatly improve learning.

Research showed that a joyful experience which includes interest, involvement and the happy creation of meaning and understanding on the part of the learner, speed up the learning process. Furthermore, there should also be opportunities for physical movement, e.g. for learners to leave their desks in order to assist peer learners, or to examine their work (Meier, 2000).

Net-Op School (Danware Data, 2002) is a powerful tool that enhances microcomputer-based training. The application can be used in physical classrooms such as data-labs, as well as virtual classrooms where the lecturer and learners are physically separated, but connected via a LAN, WAN, intranet or Internet. Designed as a teaching tool for lecturers, Net-Op School functions as an interactive blackboard, allowing the lecturer to broadcast information from the lecturer's microcomputer to a number of learners simultaneously. The control panel provides the lecturer with an overview of the learners' activities in the classroom. Lecturers can choose to give a demonstration to instruct one, several or all learners at the same time, while the learners' keyboards are locked for the duration of the demonstration. Lecturers can monitor learners as they work, or they can individually and interactively work with a learner if necessary. The microcomputer laboratory that was used, is equipped with:

- 48 microcomputers;
- a microcomputer for the lecturer to demonstrate from;
- a local area network;
- Net-Op School software; and
- a white board.

The specific learning/teaching situation can be described as diverse with relation to languages and culture. In a diverse classroom, some learners have limited English proficiency, i.e. their primary or home language is not English, and they depend on

their home language for communication and understanding. Using visual aids to supplement printed material and audio or lectures, may develop their language skills, as well as comprehension (McCown et al., 1996:107; Merrill, Hammons, Vincent, Reynolds, Christensen, & Tolman, 1996:323).

3.3.2 What is learning?

Ashman and Conway (1993:33), and Hergenhahn and Olson (1997:2), define learning from a cognitive viewpoint as its being a relatively permanent process that results from experience and that is reflected in known changes in performance and an awareness that learning has taken place. Learners integrate the information that has been presented in their existing knowledge base. After learning, learners can generalise from their learning experiences and are capable of doing something that they could not do before.

What is learned may not be utilised immediately, for example, learners who watch videos or demonstrations, may have learned, but may not have translated that learning into behaviour before acting themselves. To attribute a behavioural change to learning, the change must be relatively permanent and must result from experience (Hergenhahn & Olson, 1997:2-4; Kolb, 1984:38).

3.3.3 What is a learning/teaching strategy and how is it designed?

A learning/teaching strategy can be defined as an overall plan of action that combines cognitive tactics such as self-questioning, reflection, self-instruction, self-management and motivation, in order for learners to take in, retrieve, organise, integrate and process information in a situation that demands learning (Krüger & Müller, 1988:78; Schmeck, 1988:6; Ashman & Conway, 1993:34; Cole & Chan, 1994:410; Riding & Rayner 1998:80).

The generation of a learning/teaching strategy forms the bridge of what is known and understood about learning and what it means for teaching, and this depends on the nature of the current didactic situation (Laurillard, 1993:70).

Furthermore, strategies can be called upon, changed and managed in order to suit a learner's individual style or a given learning situation or an academic task (Ashman & Conway, 1993:34; Weinstein & Van Mater Stone, 1996:419; Riding & Rayner, 1998:86). It is the view of the researcher that a change in the design of instruction or teaching strategy may change the degree of learning. Therefore, in the design of this strategy, the researcher also recognised that individual differences exist that influence the use and success of specific strategies.

Biehler and Snowman (1997:334-340), Riding and Rayner (1998:90), Laurillard (1993:71), Cole and Chan (1994:93-103 & 416) and others listed a number of activities that a learning/teaching strategy should include, in order to allow learners to manage independent and self-directed learning. These are summarised as follows.

- Create a plan (specific strategies) to use to achieve a goal.
- Implement the plan by providing active experiences.
- Provide interaction between the learner and the world at the level of the task devised by the lecturer to integrate learning into real situations.
- Implement feedback on progress on both a formative and summative basis.
- Monitor progress (e.g. observe own practice while doing).
- Learners' reflection on their description of their conceptions, on a goal-action-feedback cycle.
- Analyse and evaluate the outcome in order to make a decision about further learning.
- Meta-cognition takes place.
- Modify the plan, the methods, or even the original goal, if appropriate.

3.3.4 Theoretical framework of the learning/teaching strategy

Since there are some key concepts that are understood and used in different ways in the debate on OBE, it is important to distinguish between cognitive, constructivist and experiential learning perspectives as they relate to OBE.

Ashman and Conway (1993:40-43) have found that education programmes based upon cognitive classroom methods, affirm and enhance successful learning. The most positive statements made about these programmes are, that they assist learners to develop their information processing, learning and problem-solving skills through their active involvement in all learning activities. Conversely, behavioural tasks require a low degree of processing (e.g., basic paired associations, discriminations, rote memorisation) and seem to be facilitated by strategies such as reinforcement. A problem with behaviourism is that, although learners are focused on clear goals and can automatically respond to the cues of those goals, they may find themselves in a situation where the stimulus for the correct response does not occur, and therefore, they cannot respond. For example, learners who have only learned to select options from toolbars in software applications, and have never explored the menu as alternative, will not know how to respond in case of a missing toolbar.

Cognitive tasks require an increased level of processing, which enables learners to understand a task as a whole. Gestalt theories fall within the cognitive paradigm and describe learning in terms of information, expectancies, principles, and insights. The learner thinks about all the tools available to solve a problem, and apply them cognitively and in practice, until the problem is solved and through the solution, gets insight into the problem (Hergenhahn & Olson 1997:255; Fraser et al., 1993:43). The term 'meta-cognition' describes learners' awareness of their own mental processes. It includes competence in planning, reasoning, monitoring, self-questioning and self-directing activities. This self-awareness forms a major part of personal development and the development of a learning strategy to enhance learning (Ashman & Conway 1993:33; Weinstein & Van Mater Stone, 1996).

The cognitive-constructivist perspective view of learning emphasises that learners create or construct their own knowledge, through reflection, from meaningful actions and interactions with the world (Woolfolk, 1995:196). They build on prior knowledge, on peer contributions, and from realistic experience. Because learners are able to interpret multiple realities, they are able to apply existing knowledge in order to deal with real life situations.

Constructivism builds upon cognitivism, in the sense that it accepts multiple perspectives and maintains that learning is a personal interpretation of the world. In a transmission lesson, the endpoint is predetermined, while in the constructivist lesson, the endpoint is a question mark, and not a period. Piaget (as quoted by McCown, et al., 1996:3), believed, that people use their intellect to make sense of their environment and to form useful mental representations of it. For example, in order to make sense of using a mouse or a keyboard, the learner must use mental processes, such as:

- implementing schemes to investigate the use of the object e.g. touch and movement;
- assimilation to similar things for which prior knowledge exists, such as a joystick, that has before been used to play games;
- accommodation of a new experience that will modify existing cognitive structures in case of no prior knowledge; and
- equilibration to balance new experiences with present understanding.

3.3.5 Experiential learning (EL) as strategy

Academics have always been aware of the fact that 'imparting knowledge' does not succeed as a teaching aim (Laurillard, 1993:13). From a cognitive-constructivist perspective, comprehension is the most important outcome of learning and knowing cannot be separated from learning-by-doing. Furthermore, teaching learners how to think about situations, to monitor their own learning, and to learn how to learn (meta-

cognition), are of the most important objectives of schooling (McCown et al., 1996:205,236).

From the theories discussed in the previous paragraphs, as well as Nightingale and O'Neil (1994:53-59), it is derived that quality learning occurs when learners:

- become actively involved in the learning process through different means such as observing, having image-rich experiences, working collaboratively and reflection;
- are able to discover and construct new knowledge;
- are able to relate prior knowledge to new knowledge;
- are able to apply competencies to solve problems in new situations;
- can communicate competencies to others;
- have long-term retention of competencies; and
- want to know more.

The concept of EL is an established approach in the tradition of adult education theory, and addresses the outcomes listed above. EL can be defined as a learning model that has the following four basic phases (Kolb, 1984:21).

- An observation phase, within which the learner observes or examines an experience and draws learning from reflection on the process.
- Formation of abstract concepts and generalisations.
- A testing phase, within which the new insights or learning, which have been integrated with the learner's own conceptual framework, are applied to a new problem situation or experience.
- Having an experience or experience a problem situation.

Learners seldom learn from experience, unless they reflect upon the experience, and assign their own meaning in terms of their own goals, aims, ambitions, and

expectations. From these processes come insights, discoveries, and understanding. All experiences are conceptualised, synthesised and integrated into the individual's system of constructs that they impose on the world (Wight, 1970).

The Four-stage Model of Experiential Learning is generally known as Kolb's model. In 1976, he calls it the Lewinian Experiential Learning Model and the Lewinian model of Action Research and Laboratory Training. Kolb (1984:21) states, that John Dewey, Kurt Levin, and Jean Piaget are the founders of the approach and suggest a holistic integrative perspective on learning that combines experience, perception, cognition, and behaviour.

Furthermore, EL is the basis for the learning component of both action learning (AL) and action research (AR). Both are about learning from concrete experience, critical reflections that question insights, and learning from one another (Zuber-Skerritt, 1993:45; Weinstein, 1995). Perkins and Blythe (1994) and Elmore (1992) describe 'understanding' as something more than recalling facts or actions; it is a matter of being able to use thought demanding actions, in order to apply the skills in new ways to unfamiliar problems. EL is thus focused on understanding.

3.3.6 Action research (AR) as teaching strategy

Cognitive behavioural instruction seeks to modify behaviour by changing learners' thought patterns about how knowledge is acquired and used. A lecturer can guide learners through a series of mental activities such as self-monitoring, self-checking and self-evaluation in order to help them learn and problem-solve. In this way, the lecturer's role becomes less directive and more supportive (Ashman & Conway, 1993:39).

Chickering and Gamson (1991), Nightingale and O'Neil (1994), McCown et al., (1996), Cole and Chan (1994), and Ewell (2000) have all published principles of teaching practice that will foster quality learning. Although no one lecturer can

perform all these items on the authors' checklist all the time, practising these benchmarking principles will enhance learning. Lecturers are encouraged to ensure:

- reflection on their own values and practices in order to communicate social support, high expectations, positive feedback (praise) and learner motivation;
- collaboration among learners, in an enjoyable setting, in order to improve thinking, personal interaction, risk-taking (to be curious and adventurous) and deepen understanding;
- active learning when learners construct meaning through their interactions with the environment, participation, discussions, and experiences in order to transfer knowledge to new situations;
- prompt feedback by lecturers as well as peers, regarding the quality of end products, as well as the work process, in order to focus learning on correcting mistakes, retaining what was learnt, and what needs to be practised again;
- frequent opportunities that challenge learners to reflect on what they have learned, to self-assess own standards, and to form conclusions on what they still need to learn; and
- time on task, by teaching effective time management and also allocating realistic amounts of time for learners to plan, organise, think and act, means effective learning and teaching.

A parallel can be drawn between the professional development of lecturers incorporating AR, and learner-centred education. AR aims to improve the practice of learning, teaching or training and has its origins in the work of Kurt Levin (1951). Kemmis and McTaggart (1988:5-10), Elliott (1991:69), and Zuber-Skerritt (1993:46-47), described AR as collaborative, critical enquiry that proceeds in a spiral of plan, act, observe and reflect. It is undertaken by participants in order to understand social realities, such as education, with the aim to improve the quality, as well as their understanding, of the actions within that situation.

Educators have become familiar with the concept of reflective practice through Schön's (1983) writings. His work has a historical foundation in a tradition of learning supported by Dewey, Lewin, and Piaget, each of who advocates that learning is dependent upon the integration of experience with reflection and of theory with practice. Although each argues that experience is the basis for learning, they also maintain that learning cannot take place without reflection. In reflective practice, reflection is the essential part of the learning process, because it results in making sense of or extracting meaning from the experience (Osterman, 1990).

The lecturer is the inter-actor in the learning/teaching strategy and shares responsibility with the learner in a win-win situation. To clarify the expectations from both the lecturer and the learner in this interactive process, Figure 3.2 illustrates the separate and combined roles of the lecturer (1-4), and the learner (a-d), and indicates the influence of the lecturer as a mentor. These roles are explained with reference to computer competencies in the paragraphs that follow.

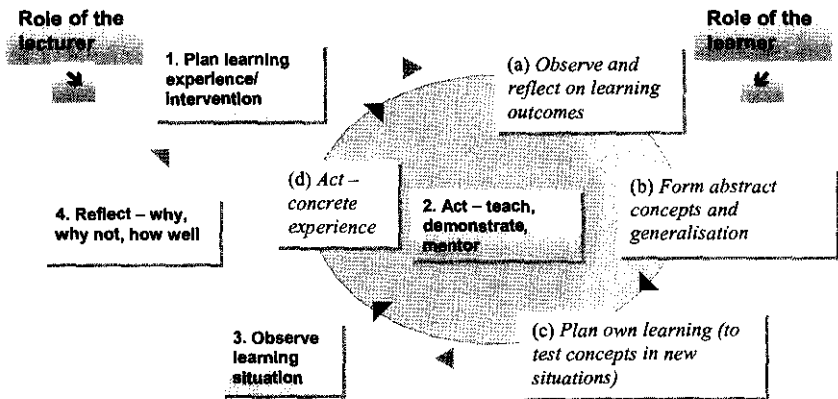


Figure 3.2 The learning/teaching strategy for accelerated computer competency courses: integrating EL and AR

3.3.6.1 Planning the learning experience

In order to be able to teach successfully and intentionally, the lecturer plans the expected outcomes for each lesson. In a microcomputer laboratory, there needs to be a dynamic interchange during which learners are eager to contribute. Therefore, it is necessary to move back and forth from demonstrations and discussions to questions and reflections, while the strategy should not be seen as a fixed pattern.

3.3.6.2 Demonstrating while learners observe and form abstract concepts

Cognitive modelling is an instructional approach that combines the demonstration of skills and concepts with verbalisation of cognitive activity that accompanies the skill (McCown et al., 1996:266-7). The lecturer demonstrates the skill or concept, speaks aloud, indicates the steps or characteristics, provides reasons, and makes remarks to show learners that handling a task systematically, has positive consequences.

Physical knowledge about objects is gained through experiencing their perceptual properties (McCown et al., 1996:57). The lecturer demonstrates, for example, the physical properties of permanent storage media by enabling learners to inspect these devices in order to experience the difference in materials. Logic-mathematical knowledge is developed when learners construct knowledge that goes beyond physical experience and depends on inventing patterns of ideas. When learners need to construct knowledge about organising files in folders, they are lead to think of drawers in a filing cabinet. They will eventually acquire the ability to save files in folders without thinking of the concrete example.

Bandura (1986) combines behaviourism and cognitive theory to explain how observers can learn without performing. He demonstrated that learners learn by watching others and that such learning occurs with or without imitation and reinforcement. The brain prefers images (visual, auditory, kinaesthetic, emotional, etc.) to printed words such as found in books, presentations, overhead transparencies, and flipcharts. The brain absorbs and stores images, which are

concrete and instantly memorable (Meier, 2000:158). The technological age has provided observers with a multitude of models in a variety of communicative contexts, of which Net-Op School is an example. However, the following four variables influence observational learning and should be taken into consideration (Bandura, 1986:52).

- Attentional processes, the learner's maturation, and prior knowledge, will determine what the learner has observed. If observational learning fails to occur, it could be that the observer did not observe the relevant activities, was incapable of performing them, or did not have the proper incentive to perform them (Hergenhahn & Olson, 1997:334).
- Information gained from observation, must be retained if it is to be of any value. A learner's verbal ability largely determines retentional processes that store pictures of the modelled experience. Verbal retentional processes reinforce visual images and these stored symbols are retrieved and acted on, long after the observational learning has taken place.
- Behavioural production processes determine whether learners can translate what they have learned into performance. A period of cognitive rehearsal (exercise or practice) is necessary before an observer's behaviour can match that of a model. During the rehearsal process, learners observe their own behaviours, and compare it to their cognitive representation of the modelled experience (reflection). This feedback loop may continue until there is an acceptable match (re-try until succeed).
- Motivational processes provide a motive for translating learning into performance by trying to act similarly to the model. The lecturer would i.e. provide a picture of the final product in order to arise curiosity before explaining step-by-step how to approach and solve a problem using Net-Op School. Learners are further willing to demonstrate what they have learned if they are offered points, grades or admiration by the lecturer.

3.3.6.3 Observing while learners test concepts in new situations

After the skill or concept has been presented, learners are given the opportunity to practise with guidance from the lecturer. The lecturer provides learners with problem-posing and information-accessing exercises that stimulate them to think, make connections, build new neural networks, and create actionable meaning and value for themselves. Image-rich experiences through concrete examples can teach much more in less time with less effort than words alone ever could (Meier, 2000:159). The success of learning is in the follow-through actions after observation in order to reinforce what has been learnt. Learners should experience both rewards and consequences of applying the new knowledge and skills in hands-on exercises and assessments.

While the learners plan and implement their practice, the lecturer monitors their understanding and zones of proximal development, and provides feedback in order for learners to improve their performance. Immediate feedback acts as a reinforcer if the solution is correct, such as, "...your skills are improving", and as a corrective measure if the solution is incorrect. Individual questions can guide learners to make new discoveries or the required discovery and to become aware of inadequacies in their ways of thinking. One of the advantages of providing concrete experiences to learners is that they also obtain feedback from the trials they conduct. If learners experience problems, the skill is re-taught or reinforced, perhaps by using a different explanation (after reflection) and demonstration. If learners perform adequately during guided practice, they move to independent practice with only periodic checks by the lecturer.

3.3.6.4 Reflecting on learning (meta-cognitive skills)

Weinstein and Van Mater Stone (1996) and Cole and Chan (1994) believe, that learners should be encouraged to learn independently and monitor their own learning processes in order to allow them to become self-regulated. Meta-cognition can be described as thinking about our thinking or consciously controlling our

cognition (Cole & Chan, 1994:400). It is important to provide learners with strategies and experiences that develop the required meta-cognitive skills, in order to foster self-monitoring or reflective skills.

Learners can be guided to reflect in action as events are unfolding, so that they can think about reasons for what was going on as it happened, as well as to reflect on the learning experience at the end of each session. Except from asking what they have learned, they should also ask how did they learn, and what lessons can be drawn to allow better learning the next time (Rose & Nicholl, 1997:66). A failure, from which they learn important general principles, is more valuable than a one-time lucky success from which they learned nothing to draw on in future.

However, in practice, lecturers cannot assume that all learners will engage in meta-cognition. During the introduction phase of an accelerated learning course, learners are explicitly introduced to reflective techniques in order to enable them to practise meta-cognitive skills. Lecturers and learners may co-operatively generate a set of self-directed questions such as the following, as part of informal assessment, which they refer to after each session, until reflection becomes a natural process.

- What did I just learn? (Explain or demonstrate it to a peer; tick off next to the outcome in the workbook).
- What am I doing, and how am I doing it?
- What do I need to practise again? (Make a note next to the outcome in the workbook).
- What went well? (Share your success with a friend).
- What went wrong? (Discuss your problems with a friend or the lecturer).
- How can I do it better next time?
- Did I find out everything I needed to know? If not, why not?

In addition, the lecturer guides learner reflection at the end of each day, with questions such as the following.

- What did you most/least enjoy about today's lessons? Why?
- What was your biggest success today, and are you happy about it?
- Is there a pattern in your success? What lessons can you learn from this in future?
- What, if anything, did you not understand?
- What could you do to ensure that it is understood? Ask a partner?
- How do you handle/react to problems?

3.3.6.5 Reflecting on teaching

We do not learn from experience as much as we learn from reflecting on the experience (Posner, 1993:20). Reflective teaching emancipates lecturers from mere impulsive, routine activity, and enables them to critically evaluate and interpret experiences, in order to form fresh perspectives and act intentionally, by selecting applicable goals, methods, problems and new strategies of teaching (Cole & Chan, 1994:105).

Reflective practice is a mode that links thought and action with reflection through a systematic inquiry into the practice itself. The lecturer consciously thinks about, and critically analyses the effect of his/her actions, with the goal of improving his/her professional practice (Osterman, 1990).

When a given situation, that produces an unexpected outcome or surprise, on which the lecturer has to act spontaneously, confronts him/her, the surprise can lead to reflection-in-action (Schön, 1983). While the situation is underway, the lecturer monitors and reshapes the learning process as follows, in order to improve his/her practice.

- Are learners able to deal with specific details, e.g. how to position an object, or do they first need to see the whole document to fit the detail?
- Which learners need encouragement to begin work (to plan and implement their plans) and who self-initiate readily?
- Do learners keep track of learning that has occurred (e.g. using study notes or personal memory aids or the workbook) or do they believe that memories will not fail? Do they need to be encouraged to tick off reached outcomes in the workbook?
- Is there an unplanned occurrence in the classroom, which can be utilised to explain what just happened, and how the method can be used in a variety of contexts?
- Reflection-on-action occurs when the lecturer follows up the situation with questions, such as the following, in order to form a new understanding of what happened during a session.
- Could I improve my presentation of the learning content?
- Did I allow adequate time for exploration across all aptitudes?
- Did I reinforce, provide feedback and time for reflection?
- Was there sufficient provision for learners to demonstrate their own understanding to themselves, their peers and to me?
- Did the learners progress in their understanding of their own learning process?

3.4 RESEARCH QUESTIONS

The objectives of the research project were to answer the following research questions.

- What are the concerns and expectations of the learners about the new module design?

- What are the learners' perceptions of the relevant learning/teaching strategy?
- What are the perceptions and expectations of the learners, who attended the accelerated module, about their lecturers?
- Is there a comparison between the two groups of learners' perceptions with regard to outcomes-based learning/teaching?
- Is there a comparison between the two groups' perceptions about their lecturers?
- How do the competency and retention of the two groups differ with regard to the exit level outcomes?

3.5 RESEARCH DESIGN

The researcher developed and implemented the learning/teaching strategy for the computer competency module, over three semesters, by following the basic cycles of AR activities as interpreted by Kemmis and McTaggart (1988), Elliott (1991) and Zuber-Skerritt (1993). After identifying the research problem, a research team engaged in reconnaissance, planning and re-planning, implementing action plans, and observing and reflecting. The underlying epistemology for this research was post-positivistic, interpretative, and holistic in nature.

Reflection played an integral part in the case study and the research team documented observations and reflections in research diaries. Schön (1983) clearly writes about reflection that is intimately bound up with action. Rather than attempting to apply scientific theories and concepts to practical situations, professionals should learn to structure and restructure the often complex and ambiguous problems they are facing, test out various alternatives, and then modify their actions consequently.

A variety of approaches have been employed to foster reflection in learners who followed the accelerated module, as well as to obtain first-hand holistic

understandings of learners' views, experiences, and needs. The learners were required to:

- reflect by means of open-ended questionnaires upon their perceptions, concerns and expectations of the accelerated module before, during, and after the presentation of the module;
- reflect upon their skill acquisition during, and after the presentation of the module; and
- complete structured questionnaires on the last day of the module, and another questionnaire with the group of learners who attended the semester course, five months later.

3.6 POPULATION AND SAMPLING

The study group consisted of 72 learners enrolled for the National Diploma in Food and Beverage Management in the Department: Food. A total of 45 learners attended the accelerated module scheduled over two weeks of the semester, while 27 learners attended the traditional course with traditional teaching methods, scheduled over the whole semester.

3.7 IMPLEMENTATION OF THE LEARNING/TEACHING STRATEGY: A TYPICAL LESSON

Figure 3.3 illustrates the combined and separate tasks of the lecturer and the learners in a typical lesson, following the AR and EL cycles within the particular didactic situation.

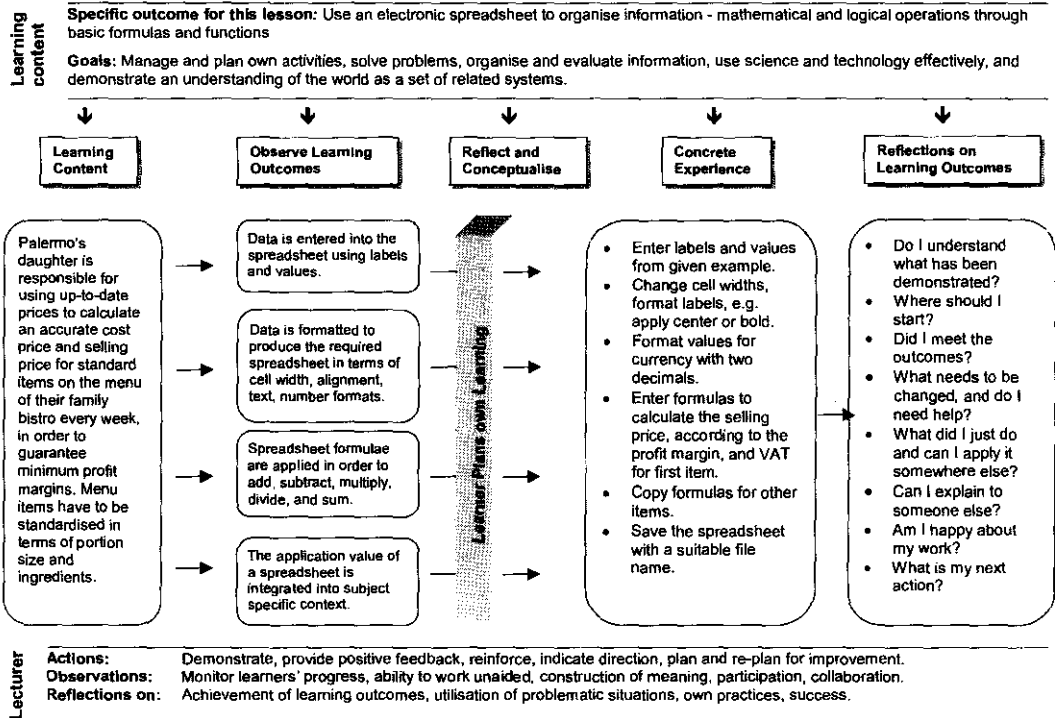


Figure 3.3 Example of lesson plan that illustrates learner and lecturer reflections on learning outcomes through demonstration, observation, concept formation, action plans and concrete experiences

3.7.1 Tasks of the lecturer

- Planning the lesson in order to reach the specific outcomes within a certain period. Selecting the appropriate learning content.
- Demonstrating the use of Net-Op School by explaining aloud, while learners observe, as explained in Figure 3.4.
- The lecturer provides exercises, encourages learners to plan and start work, and controls the completion of tasks on time.
- Observing learners during the demonstration. Observing learner actions while they plan and do exercises, and noting their progress.
- If a learner encountered a general problem, reacting to what happened by calling the class to attention, with the attention feature of Net-Op School, demonstrating what had happened, and explaining how to correct the problem.
- Reflect in action, in order to take immediate corrective measures when problems occur and reflect on action during the afternoon sessions in order to re-plan for the next day.

"The selling price equals (type =) cost price (click with the mouse on the cost price of the item in cell B2) plus (type an open bracket) 30% (click with the mouse on the percentage in C2) of (type * for multiply) R4.95 (click with the mouse on the value in cell B2)."

	A	B	C	D
1	Item	Cost Price	% Profit	Selling Price
2	Fruit Cocktail (per litre)	R4.95	30%	=B2+(C2*B2)
3				

Figure 3.4 Example of a demonstration to enter a formula, while explaining out loud

3.7.2 Tasks of the learner

- Observe the demonstration of new concepts and reflect on the learning outcomes.
- Formation of abstract concepts and generalise.
- Plan own learning experience when attempting new assignments and exercises. Learners describe to each other in detail what they have just learned and how they are going to apply it. Learners do exercises in their workbooks, ask questions and work collaboratively on solutions to problems, share ideas, knowledge, and skills with peers.
- Observe and monitor own progress through lecturer guidance, peer feedback, and reflection on outcomes and self-assessment in workbooks.
- If the learner did not reach the outcomes planned for the day, he or she should plan a next learning experience in a self-directed manner during the afternoon practice session.

3.8 FINDINGS AND DISCUSSIONS

Meier (2000:66) recommends, that, in order to create positive feelings, learners are informed about a new learning experience before the start of a course. On the first day after enrolment, learners attended an information session during which they were informed of the reasons for attending the accelerated module. The following were explained to them:

- the rationale for the accelerated module;
- clear statement of expectations on both sides (lecturer, learner);
- time management;
- anticipated outcomes; and
- ground rules and agreed communication.

The learning/teaching strategy comprised two ground rules.

- Learners had to learn with and from each other. When they have completed their exercises, they assisted each other, but without doing the work for peers, that is, what the latter can, and must, do for themselves.
- Learners had to reflect after each learning experience by asking themselves the question, "What did I learn and how can I build on that?"

3.8.1 Concerns and expectations

During the information session, the learners had to write down their concerns and expectations of the module. All learners expected to become fully computer literate in order to use those skills in their assignments and careers. However, some said that they would need more practice in order to remember the skills. Table 3.1 summarises learners' expectations and concerns regarding the accelerated module. Remarks (quotations from the original questionnaires) have been edited for correctness and readability.

Table 3.1 Concerns and expectations of learners before their attendance of the accelerated module (N=45)

Concerns/expectations	%	Remarks
The duration of the module is too short, and time for practice will not be enough in order to remember the skills.	32%	<i>"...some of us never used a computer before, which means they are going to struggle. You can make it for 3 weeks and practise often."</i>
The accelerated module is a good idea, since learners are going to need computer competencies in order to complete assignments in other subjects.	68%	<i>"...I will cope with computer. I really need it. I don't have any concern. Because other people who are going to teach me they are involved in it, so I really need it."</i>

Learners completed a questionnaire on the last day they attended the module, in order to allow them to reflect on unfulfilled expectations and further concerns. The results are indicated in Table 3.2.

Table 3.2 Unfulfilled expectations and further concerns at the end of the accelerated module (N=45)

Concerns and Unfulfilled Expectations	%	Remarks
Two weeks were not enough to absorb all the learning content	7%	<i>"...time was too short because I did not know anything about computers."</i>
The accelerated learning pace was strenuous and too fast	4%	<i>"The hours were too long and strenuous..."</i>
Learners had no concerns, were satisfied and enjoyed the experience	77%	<i>"No concerns... it was an excellent course...the practice was learnful, with lots of examples."</i>
Unsure	12%	No comment

3.8.2 Learners' perception of the learning/teaching strategy

During the information session, learners also had to discuss their learning styles and the benefits of learning how to learn. Learners agreed, that in order to learn successfully, it is important to:

- take notes and make summaries, and
- prepare for a lesson by reading through the outcomes in order to know what to expect during the following learning experience, and to reflect on what they already know.

Table 3.3 reports their opinions regarding the need to adapt a different learning strategy.

Table 3.3 Learner opinions regarding using a new learning strategy (N=72)

Statement	Agreed	Disagreed
The new learning strategy will improve my learning skills	83% <i>"...I like trying out different methods. Another method can get me a 100% pass!!!"</i>	17% <i>"...I don't think that I'm sure, that by this method I'm going to improve."</i>

3.8.3 Perceptions of the lecturer

One of the successes of accelerated learning is in the learners' beliefs in their lecturer. Table 3.4 shows the learners' trust in their lecturer to guide them to succeed; the first remark before the start of the module, and the second remark, after completion of the module.

Table 3.4 Learners' trust in the lecturer as a facilitator. (N=72)

Views before and after the accelerated module	%	Remark
Learners have enough trust in the lecturer for supporting them to succeed before the start of the module.	68%	<i>"I think two weeks is not enough. You should make a point of it to let us practise for an hour per week after the two weeks. I trust you with what you are doing and know that with your help and attention, I will pass."</i>
Learners' trust in the lecturer, proved to be positive and they are satisfied with what they had learnt after completion of the module.	95%	<i>"I know everything now...when you are speaking, I do understand, but I have taken so long to get where I am supposed to click." "...but I think now I can do everything. Thanks to my lecturer."</i>

3.8.4 Perceptions of outcomes-based education

At the end of the semester, all 72 learners (those who attended the accelerated module and those who attended the semester-course with traditional teaching

methods) completed a structured questionnaire. The learners perceived the accelerated module as outcomes-based, in contrast with those learners who attended the semester course. Figure 3.5 shows, that learners who attended the accelerated module, were to a greater degree focused on reaching the outcomes of the module, than were the semester group. Reflection-on-action provided positive feedback to the learners who attended the accelerated module, providing them with the impression that they are able to succeed.

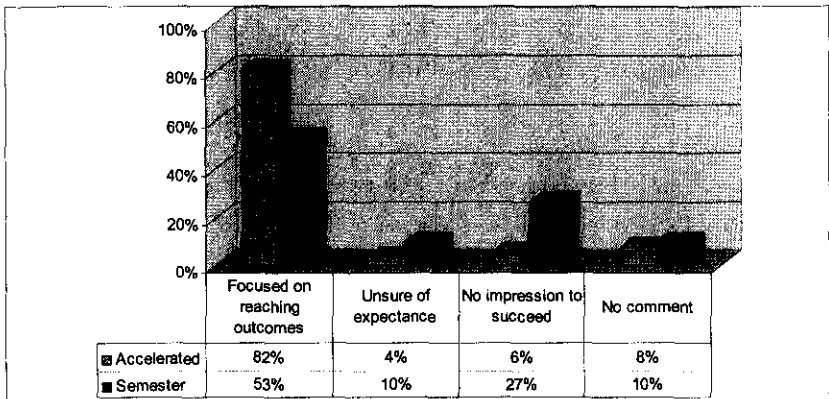


Figure 3.5 Learners' perceptions of the module as outcomes-based

3.8.5 Learners' perceptions of the lecturer as facilitator

Figure 3.6 shows that those learners who attended the block module, perceived the lecturer as someone who could guide and facilitate, allowing for mistakes and enabling each learner to learn on his/her own pace, in contrast with learners who were taught in the traditional way. The researcher also experienced that learners were tempted to ask more questions and openly discussed particular problems.

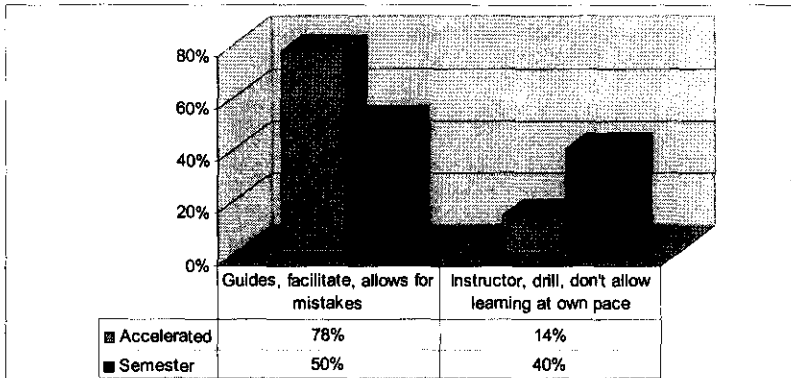


Figure 3.6 Learners' perceptions of lecturers as facilitators

3.8.6 Competency and retention

Two lecturers in the Department: Food, required of all learners to hand in typed assignments. During a structured interview, they said that competent learners guided those learners, who were not competent yet, and that the quality of assignments improved in comparison with those of the previous years. Figure 3.7 indicates the difference in competency and retention levels by the end of the first semester. Learners who attended the accelerated module, acquired their computer competencies in such a way, that they had almost no difficulties to type the assignments, and 67% felt that they will retain those competencies in future, without having to revise it again.

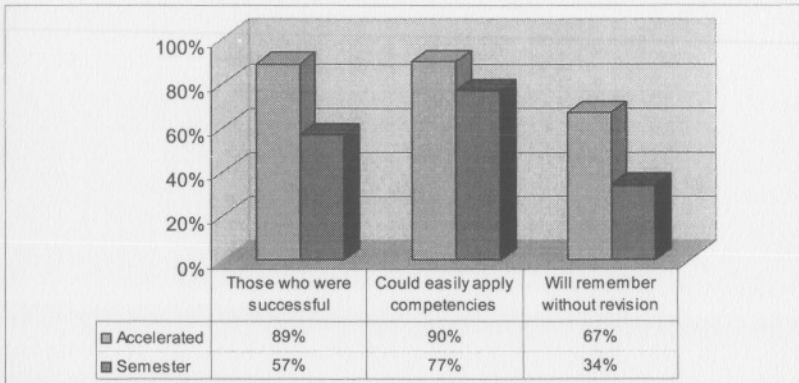


Figure 3.7 Differences in competency and retention levels

In this section, the authors established that the specific learning/teaching strategy lead to an increase in learner-performance, which has lead to improved achievement and enhancement of motivation to learn in ways that are more effective.

3.9 CONCLUSION

Enabling learners to learn effectively in an accelerated context requires a lot of energy, trust, and enthusiasm from both the lecturer and the learners. The learners realised their need for computer competencies, were open to alternative learning strategies, and participated actively in the accelerated learning process.

Action research, combined with demonstration, enables the lecturer to facilitate and lead in a journey of discovery. Almost all the learners perceived the lecturer as someone who motivated and empowered them in order to succeed, in contrast with the learners who were taught traditionally. The learners were constantly focused on reaching the outcomes through a process of reflection-on-action and, in contrast with the learners from the semester group, had confidence in their own abilities to

succeed. This shows, that the learners perceived the learning/teaching strategy as outcomes-based.

The competency rates of the two groups differ significantly. Of particular importance, is the finding that the accelerated experiential learning strategy enhanced the learners' retention, comprehension, and ability to integrate knowledge and skills to their advantage during the semester that followed the module.

The study has however, clearly identified issues within the accelerated learning context that are to be refined or to be given special attention.

- Time for the lecturer to reflect, was restricted during the course of the module. Only careful planning of daily activities allows for reflection and re-planning.
- In order to prevent exhaustion, the lecturer may need to include a variety of physical activities, music, and relaxation exercises.
- Time for learners to reflect on outcomes, is possible, but over a short period, deep reflection is not possible.
- Lecturers need extensive training in meta-cognitive and reflective teaching skills. It is also important that lecturers are encouraged to persist in using the strategy.

This learning/teaching strategy is a dynamic process that provides an instructional framework for lecturers and a learning framework for learners. It is a realistic teaching approach that can be integrated into practical classroom practice. Although the ultimate goals of AR and EL are the development of critical intelligence and creative thinking, the expansion of the knowledge base in terms of shared theory, techniques, ideas and experiences, was also enhanced. It has been shown, that the core idea can successfully be applied to foster learning on other levels of cognitive development in an entirely different field.

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CHAPTER 4

CONFLICTS IN ASSESSMENT WITH REGARD TO INTEGRATION AND FRAGMENTATION IN DESIGNING A MODULE FOR END-USER COMPUTING

ABSTRACT

The South African Qualifications Authority Act (1995) challenged the traditional curriculum of isolated subjects by implementing critical outcomes that will develop life-long learners so that they reach their full potential in our society. Lecturers need to educate minds that are well informed over a wide range and that are practised in finding and using information in the solution of real problems. Lecturers in the Department of Computer End-using at the Vaal Triangle Technikon developed a modular curriculum for End-user Computing integrated with and assessed by those concerned during the learners' other learning experiences. The objective was to implement outcomes-based assessment methods, as well as pre-assessment and more continuous assessment opportunities. Although a module should always form part of a larger curriculum, with the achievement of long-term goals in mind, research revealed that in Information Technology (IT) certifications assessment is often based on examinations at the end of units that form fragments of that certification. In this article, the authors report on the conflicts that exist in the assessment procedures for IT modules in higher education institutions. They finally concluded, that an integrated approach to assessment offers IT learners the optimal learning experience.

4.1 INTRODUCTION: WHAT ARE THE NEEDS OF HIGHER EDUCATION WITH REGARD TO COMPUTER COMPETENCY?

The purpose of higher education cannot be separated from the debate about the expectations of society. The White Paper on Higher Education Transformation (SA,

1997b:5) states, that higher education must be restructured so as to meet the "...needs of an increasingly technologically oriented economy". This challenge, and the intense competition to become employed, results in the need for an increasingly highly educated, skilled labour force. Failure to apply these skills effectively, is as detrimental as not having the skills at all (Strydom, Hay & Strydom, 2001:5-7; Knowledge Network, 2000). Furthermore, Stephenson and Yorke (1999:3) define capability as integration of knowledge, skills, personal qualities and understanding used appropriately and effectively in response to new and changing situations. Learners in higher education are expected to integrate Information Technology (IT) across all fields of learning in order to search for, analyse, and manage information in their respective academic programmes. The problem is to equip learners with computer competencies as soon as possible, so that they become both capable and employable.

The Department of Computer End-using (DCEU) at the Vaal Triangle Technikon (VTT) offers computer competency courses to learners enrolled for different programmes. The researcher conducted a case study during the period 2000 – 2001 in order to design a more skills-based programme and to equip learners with computer competencies at the start of the academic year. The case study involved all 72 first-year learners enrolled for the National Diploma in Food and Beverage Management (F&BM) in the Department: Food. The researcher developed and implemented a block module for the discipline, End-user Computing (EUC), comprising of 60 notional hours and 6 credits, which was scheduled full day, over two weeks, at the start of a semester. Of the 72 learners, 45 attended the block module, while 27 learners attended the traditional semester course.

In the South African context, a 'credit' is defined in terms of the amount of learning expressed in numerical points in relation to the level of learning. 'Notional time' refers to the average time that an average learner spends on achieving the outcomes for the module (SAQA, 2000b:3). A module is a coherent element of learning, designed to achieve a set of specific learning outcomes, assessed within that element of learning. It always forms part of a larger curriculum or is used with

the achievement of long-term goals in mind and may be linked to further modules towards the achievement of long-term goals or whole qualifications (Du Pré, 2000:42; Hodgson & Spours, 1997a:20; Warwick, 1988:4-5). A block module, in particular, is a compacted curriculum that helps lecturers to focus on particular targets, encourages the development of cognitive skills, enables clear goal-setting over a short period of time (i.e. weeks), and supports co-operative learning, work-place training and action learning (Du Pré, 2000:42).

A research team consisting of lecturers from the DCEU and lecturers in the Department: Food, collaboratively formulated specific outcomes and assessment criteria that clearly communicate module expectations to the learners. Although the EUC module is presented by means of four units, all the outcomes imply, that an integrated approach should be followed, in order to guard against fragmentation (Janse van Rensburg & Vermeulen, 2002a). Breaking up the module into manageable chunks, makes the curriculum more transparent and accessible for the learner (Hodgson & Spours, 1997a:16-17). Small units, where learning outcomes (through performance indicators) and assessment criteria (through detailed range statements) are made explicit, provide learners with the tools to increase their achievement. Equally, building and integrating knowledge and skills progressively, enable learners to demonstrate their improvement so that they are assessed on what they know and can do at a certain point in time.

In this article, the authors report on an investigation into assessment within a modular framework. A modular approach, in which learners are assessed continuously, receive regular feedback, and integrate competencies into their learning programme, is compared to a fragmented, unitised approach to assessment, that is often used in vocational education and by examining bodies. The authors finally suggest an assessment strategy for a flexible, outcomes-based EUC curriculum in which learners would not only have to demonstrate computer literacy, or skills, but would need to demonstrate capability, employability and orientation in their other courses as well as in the workplace by way of the progressive integration of knowledge and skills.

4.2 PROBLEM STATEMENT

Traditionally, learners enrolled for practical computer competency courses, were assessed by means of three performance tests (practical summative assessments), at the end of each one of these units. Assessment procedures thus lacked a variety of assessment methods and summative assessment was conducted in a fragmented way with few opportunities for reflection towards improving practices. A weakness of the traditional curriculum is, that learners can complete the course, never understanding certain aspects, (e.g. file management), simply by passing two of the other units. Furthermore, there are no re-write opportunities for practical computer competency courses at the Technikon. Learners, who fail, have to repeat the course in their second year of study in the Higher Education and Training Band (NQF 5) (Janse van Rensburg & Vermeulen, 2002a).

4.3 PROJECT OBJECTIVES

There are many reasons why learners' performances are assessed. These include formative assessment for the monitoring of progress, supporting and aiding learning, improving teaching, and more summative assessment for certification, selection, and for promotion. However, assessment should always be an episode of learning and should not encourage passive, reproductive forms of learning (Le Grange & Reddy, 1998:6; Killen, 1997:30; Van der Horst & McDonald, 1997:213; Boud, 1995:44-45). Every act of assessment provides learners with feedback about what they know, and should still be learning. Furthermore, clarity of expectations motivates learners towards achievement of outcomes. In designing a modular curriculum for EUC, the researcher was concerned in planning the assessment in such a way, that it promotes active learning, integration of concepts and skills, achievement of all the outcomes, and a variety of assessment methods.

4.4 A CURRICULUM DESIGNED TO COMPLY WITH ASSESSMENT PRINCIPLES WITHIN THE NATIONAL FRAMEWORK

Through the Higher Education Act (SA, 1997a), the higher education system and its institutions are transformed into a single co-ordinated outcomes-based education (OBE) system that adheres to the vocational needs of the country. On 31 July 1998, all institutions of higher education recorded all their qualifications with the South African Qualifications Authority (SAQA) (SA, 1995:11). Based on standards set by the Standard Generating Bodies (SGB's), outcomes of interim registered technikon qualifications have to be revisited, and from 30 June 2003, final submission of qualifications will be made to SAQA (CTM, 2001). The National Qualifications Framework (NQF) in South Africa provides the means to enable all learners to achieve nationally recognised and internationally comparable qualifications. The former Information Systems and Technology Standard Generating Body (IS & T SGB) formally registered 15 EUC unit standards for the EUC domain on NQF levels 1-3 (SAQA, 2000a). Unit standards are nationally agreed, and internationally comparable, statements of the outcomes that a learner must be able to demonstrate. They are building blocks that form the basis from which learning programmes for education and training in all education and training are progressively developed. This includes assessment criteria that will ensure quality, as well as provide a benchmark for assessing prior learning (SA, 1997c:20).

Twelve of the 15 unit standards for EUC are pitched at levels 2 and 3 (equivalent to grades 10 and 11) on the NQF. The DCEU experiences that only 2% of learners are computer competent when they enter the Technikon on NQF level 5. The increase in complexity and versatility of computer technology and software requires from all skilled workers to search for, analyse, manage and integrate information in their respective careers (CHE, 2002), requiring from learners to become computer competent as soon as possible. SAQA (2000b:26) allows learners to acquire a minimum of 48 credits out of 120 at a lower level than that at which the qualification is registered, making it possible for learners on level 5 to also obtain credit for outcomes registered on levels 2 and 3.

4.4.1 Modularisation and unitisation from an outcomes-based perspective

The debate on modularisation comprises two different perspectives. Firstly, that modules are designed to form building blocks of non-unit standards-based academic qualifications, put together in particular ways in order to provide coherent learning programmes. Secondly, that unit standard-based qualifications, which have traditionally been associated with the vocational track, had different structures, assessment methods and philosophies (Genis, 2000:2; Hodgson & Spours, 1997b:106-107). In a unitised system, units are taught and at the end of a prescribed period, summative assessment against unit standards is conducted, and grades are permanently assigned and entered in the grade book or administrative system (ECDL, 2002; Spady, 1988:5). In this way, units are assessed separately and may form fragments of a qualification. Units of learning are, therefore, undoubtedly distinguished from modules for assessment purposes.

Many of the developments in the area of unitisation have taken place in and around Further Education (FE). FE colleges in SA and in other countries, such as Britain, have always offered a wide variety of qualifications, including that of vocational education, assessed by a wide range of examining bodies (Stanton, 1997:122). Accrediting agencies may lay down rules for the issuing of their certificates and, in particular, the methods used to describe performance (Hodgson & Spours, 1997b:106; Macintosh, 1988:155). Accreditation describes the process whereby a body established for the purpose of quality control, grants under agreed criteria its official approval to institutions in order to carry out assessment on its behalf (Microsoft Training & Certification, 2003; SANAS, 2002; AOAEX, 2001; CHRIE, 2002; Macintosh, 1988:155). Accreditation is concerned with the official recognition or certification of public examinations such as the MCSE, A+, Microsoft Office Specialist, and the ICDL. One of the major issues as far as accreditation is concerned, is the extent to which locally initiated profiles are able to retain credibility with the public. In South Africa, this occurs through the registration of unit standards with SAQA on the national qualifications framework (SA, 1995:11).

Certification relates to the confirmation through examination, that a learner has reached a particular standard or level of performance, which can be linked to a licence to practice (CompTia, 2003; Freeman & Lewis, 1998:7). It could relate to the underwriting of individuals, such as roving examiners, in the case of the ICDL, to undertake assessment on behalf of the agency, or colleges in the further education and training (FET) sector such as Damelin, CompTIA, Netscope, or MasterSkill. Most internationally branded qualifications are awarded as based on performance in once-off examinations that learners have to pass and often comprise of multiple-choice questions that are set via computers (SA, 2001). Certifications guarantee a high standard of knowledge and skills, judged on performance to practice, through the assessment on units or fragments of work; in most cases independent of any training curriculum or field experience, and therefore do not necessarily guarantee a competent workforce (Schwartz, 2002; Freeman & Lewis, 1998:7-9). In the developing of an assessment policy and practice, the following principles should be considered.

- Today's complex work environment requires a multi-faceted, innovative set of competencies with little room for eager, willing-to-learn entry-level staff (Schwartz, 2002).
- In an OBE system, learners need to acquire skills, knowledge and values that should be applied in unique and creative ways as opposed to the mere acquisition and reproduction of skills through drilling methods.
- In order for learners to become competent, assessment should challenge learners with real problems and not fragmented, static units of work.
- Assessment should be an integral component of instruction and should, as far as possible, be authentic (Killen, 1997:28).
- Authentic assessment requires learners to demonstrate higher order thinking skills in real life contexts, rather than individual skills practised in isolation (Le Grange & Reddy, 1998:33; Van der Horst & McDonald, 1997:168).

In order for technikon learners to be able to apply computer competencies in new, challenging situations, assessment within the EUC curriculum should thus integrate outcomes from various units and real-life problems.

4.4.2 A modular outcomes-based curriculum for EUC

In the OBE paradigm, it is important that the outcomes are achieved, and that assessment is related to the outcomes of the specific programme. The integration of knowledge and skills across subjects and terrains of practice is crucial for the achievement of applied competence as defined in the NQF (SA, 2002:4). The exit level outcome of the qualification in Food and Beverage Management, which the EUC module contributes to, illustrates this necessity.

- The qualifying person will be able to effectively use various modes of accessing and communicating information, including industry specific Information Technology, in order to promote the Hospitality Industry within a changing business environment.

Outcomes are what learners can actually do with what they know and have learned, i.e. actions and performances that embody and reflect their competence in successfully using content, information, ideas, and tools. Furthermore, it communicates module expectations to the learner (Spady, 1994:2; Walker, 1994:5-7). The research team and lecturers in the Department: Food, collaboratively determined the purpose of the module, learning outcomes, assessment criteria, assessment methods and credits for the module (Janse van Rensburg & Vermeulen, 2002a). Assessment criteria were formulated with a view to create equivalence with the registered unit standards, in order to make provision for articulation and mobility across and within the FET band, nationally and internationally, as required by SAQA (SAQA, 2000a).

Sometimes, the integrated curriculum will combine different outcomes to be incorporated into a single module to fulfil its overall goal. The Diploma in Food and Beverage Management (THETA, 2001) states that, "...integrated assessment is

accomplished through assessing more than one unit standard at a time. There are also a number of unit standards that are integrative in nature⁹. Table 4.1 lists the specific outcomes and assessment criteria for the EUC module for the qualification in Food and Beverage Management (NQF 5).

Table 4.1 Specific outcomes and assessment criteria for the EUC module for Food and Beverage Management

Specific outcomes (SO's)	Assessment criteria
1. Identify the need for and type of information, access information and organise information.	Electronic information sources should be used to find, access, create and use information.
2. Understand the role of computer hardware and software in the Hospitality Industry.	The major categories of software should be used to integrate applications software in the Hospitality Industry. Examples of commonly used software and its applications in the Hospitality Industry should be addressed.
3. Organise information using a computerised system.	An operating system, word processor and spreadsheet, should be applied to create, edit and save documents.

4.4.3 Valid, reliable and fair assessment practices

According to Killen (1997:30), Freeman and Lewis (1998:24-30) and Wakeford (1999:59-60), assessment should conform to the principles of validity, reliability and fairness. Assessment should apply valid or appropriate assessment procedures towards assessing the intended outcomes for the module (i.e. curriculum validity). Assessment procedures also need to be appropriate for the audience and level of competence required within the wider context (i.e. face validity), and in addition, assessment should reflect both the content and the way it has been taught (i.e. content validity) (Freeman & Lewis, 1998:24-30; Wakeford, 1999:61). For example, the EUC module should use a practical assessment approach by means of applicable assignments or problem solving, since it is designed to teach the application of computer competencies within the learners' field of study.

Secondly, assessment should be reliable in providing accurate and consistent results. When more than one assessor is concerned, all assessors should make the same judgement when presented with work of a similar standard (Freeman & Lewis, 1998:24; Wakeford, 1999:61). In a department, such as the DCEU, which provides computer competency courses to more than a thousand learners per semester, it is crucial to control and co-ordinate the duration of practical summative tests, the consistency of and across individual examiners, the provision of adequate assessment opportunities and the assessment of all outcomes, through moderation. The question is, which minimum evidence will provide fair and sensible statements or judgements about individuals. Therefore, the DCEU considered a variety of summative and formative assessment methods that can be implemented on an integrative and continuous basis, but which, nevertheless, can be implemented and moderated during the course of a block module.

Thirdly, assessment should be fair to all learners and not be influenced by irrelevant factors such as, among others, cultural background. The challenge is to devise assessment procedures with sufficient flexibility, so that all the learners have the opportunity to demonstrate their competencies in these assessed outcomes. Fair assessment also implies, that there are sufficient opportunities to learn important things (Wakeford, 1999:61). Furthermore, the Continuous Assessment Model (CASS) has been proposed as an assessment model for South Africa (SA, 1997d:1-5). CASS focuses on the ongoing manner in which assessment is integrated into the process of teaching and learning through summative assessments, observations and reflections.

The research team carefully considered both strands on modular education, i.e. modularisation and unitisation. Two assessment models were discussed, namely a model with a unit each for the introduction to computers, operating systems, word processing, and spreadsheets, to be assessed separately (Figure 4.1); and a model in which all the outcomes of the module are assessed progressively in an integrative manner (Figure 4.2). These models were measured against the criteria in the paragraphs above. The first model was rejected, for the following reasons.

- Learners would have to achieve a minimum of 50% for each separate unit, in order to prevent them from 'passing' the course on their competence in only one or two of the units.
- In order for the assessment to be fair, learners would have to be granted re-write opportunities for each unit, before they could 'pass' the course.
- The administrative system would have to be adjusted to keep record of each learner's pass rate for all the units, as well as for the course as a whole, resulting in a clumsy procedure or administrative nightmare.
- The assessment procedure cannot be considered as continuous, is not integrative and do not comply with all the OBE principles.

In the second model (Figure 4.2), the learners' progress is measured against agreed criteria, and those who meet the specified criteria for learning outcomes, receive the appropriate credit, as determined by means of reliable measures. This implies, that assessment will be conducted in a fair and transparent manner. Learners who do not meet the criteria, could receive clear feedback, and be given support to try again. The concept of pass/fail is radically altered to credit/try again. Furthermore, assessment is integrated into the learning process by means of appropriate outcomes-based assessment methods.

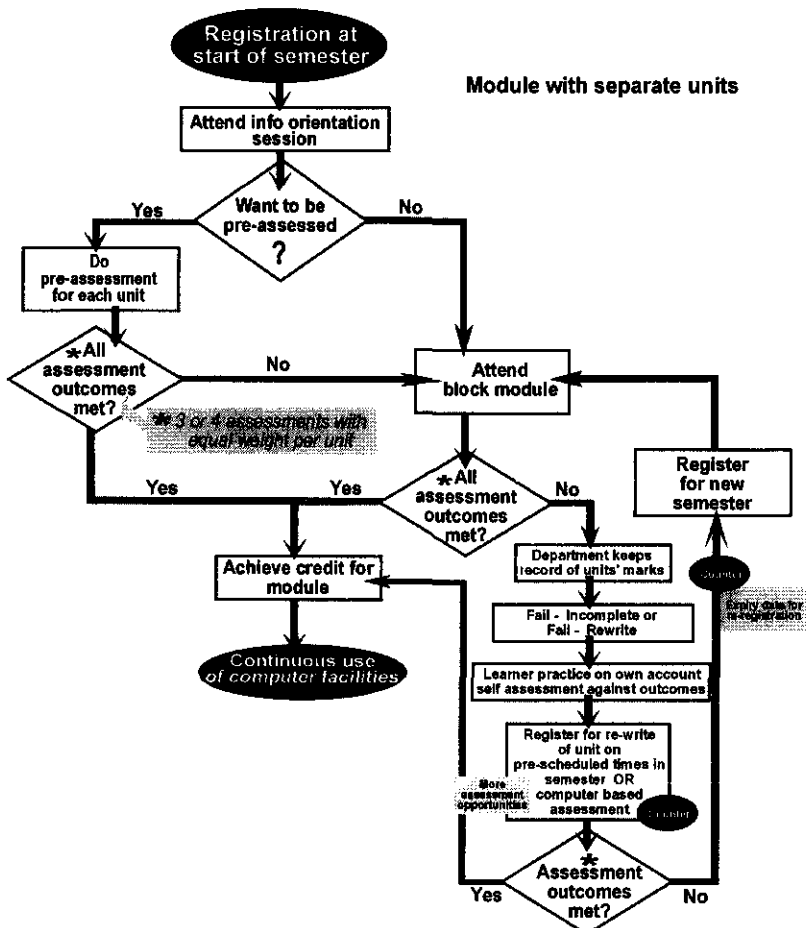


Figure 4.1 A model for assessment of a separate unit each for the introduction to computers, operating systems, word processing, and spreadsheets

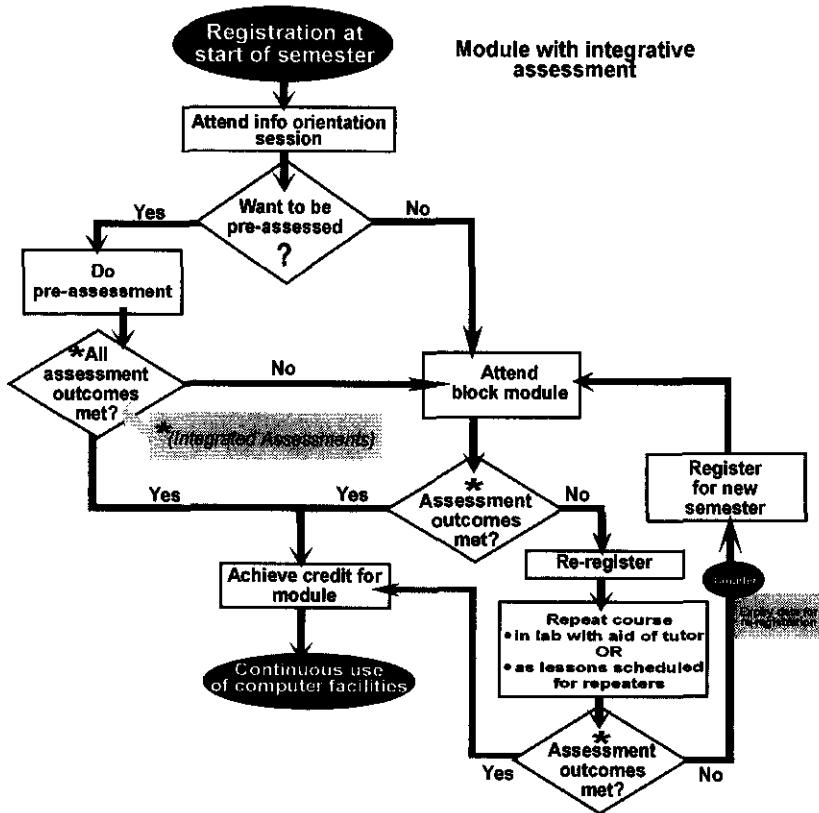


Figure 4.2 A model for assessment, in which all the outcomes of the module are assessed progressively in an integrative manner

In this section, it has been established that in higher education, assessment should be seen as an integral part of the whole curriculum and that, in order to comply with all the outcomes-based principles, assessment cannot be conducted in a fragmented and unitised way. In the following sections, the authors formulate the research questions and discuss how the second assessment model (Figure 4.2) was implemented and evaluated through an action research process. They conclude with recommendations regarding future improvements.

4.5 RESEARCH QUESTIONS

The objectives of the research project urged the researcher to answer the following research questions.

- Are assessment criteria related to the exit level outcomes for the specific programme, and what evidence will be needed in order to establish that learning relevant to this outcome has taken place? (What should be assessed?)
- Are assessment practices oriented towards producing evidence that outcomes are achieved? (How and when should assessment be done?)
- Do assessment practices engage learners in the learning process as a whole, and are learners better equipped as a result thereof?

4.6 RESEARCH DESIGN

Observation of and critical reflection on teaching practices are means of enhancing the quality of teaching and learning and form an integral part of professional development (Fullerton, 1999:220; McNiff, 1993:20-21). Furthermore, a critical educational science involves research in and for education and is directed at the transformation of educational practices (Carr & Kemmis, 1986:156). A research team consisting of lecturers from the DCEU planned and conducted a case study during the period 2000 – 2001, observed the teaching and learning process for a

further period during 2002 and implemented final changes in 2003. The research design can be characterised as post-positivistic, qualitative action research (De Vos, 1998:357). Action research cycles unfolded in the course of the project, during which the research team alternated action with critical reflection and further research. Data were collected at different stages of the project by means of questionnaires completed by the learners, individual interviews with and observations by lecturers in the Department: Food, reflection diaries kept by the research team, as well as by way of assessing results.

4.7 FINDINGS AND DISCUSSIONS

In this section, the authors discuss the implications that the implementation of the block module had on assessment, as well as the results of the study obtained over a period of two years, in response to the research questions. All 72 learners attended an information session during which they were informed about the course, the case study, assessment opportunities and assessment methods. The learners also had to write down their expectations of the course in an open-ended questionnaire. Three learners viewed themselves as being computer competent, and did the pre-assessment test while 23 learners expected to become fully computer competent so that they could independently use computer technology in general. The remaining 46 learners realised that it will be to their own advantage to learn to use a microcomputer in a job-related environment in order to become a better employee in the hospitality industry, or to manage their own business. Table 4.2 shows some of the learners' views.

Table 4.2 Learners' views with regard to their expectations for being able to apply computer competencies

Specific need	Learner's view
Assignments	<i>"I would like to utilise a computer effectively to do my assignments, because I am a dedicated person."</i>
Industry related	<p><i>"...everything that there is to learn, in order to be a receptionist at an hotel (in the real world)."</i></p> <p><i>"I want to gain extensive knowledge about the use of computers so that not only I am computer literate, but also to benefit from it in the workplace."</i></p> <p><i>"...I would go into the workplace with enough knowledge of the computer, e.g. to work out a monthly budget, type recipes, and work out the profit for the food I make."</i></p>
Own business	<i>"...be able to use Windows and to do things through a computer, like communications, calculations and expenses to run my own business."</i>
Lifelong learning	<i>"...to learn to use a computer for the rest of my life, and how to run a business."</i>

The first 45 learners, who enrolled, were selected to attend the block module. For the block module, the assessment model illustrated in Figure 4.2 was implemented. Learners were granted pre-assessment, progressive assessment and more formative assessment opportunities. Of the learners who attended the block module, 91% felt that they had enough formative assessment opportunities and were not assessed only summatively, while only 67% of the semester group were of the same opinion.

4.7.1 Evidence established, that learning occurs when competencies are integrated in other learning experiences

Learners from both the block and the semester groups were assessed against carefully formulated assessment criteria and range statements for the EUC module, derived from the exit level outcome (ELO) for the National Diploma in Food and Beverage Management. These statements imply, that learners should be assessed

on computer competencies as well as their capability to integrate these competencies within changing business situations, and to learn from experience.

A total of 89% of learners who attended the block module during February 2001, were successful, while only 57% of learners who attended the semester course, were successful. The outstanding results of the learners, who attended the block module, were probably the outcome of the rigorous learning process and the fact that they retained what they had learned by the end of the two weeks. All the learners completed a questionnaire at the end of the semester. All the learners also had to type assignments with Microsoft Word for assessment in two other courses. Figure 4.3 displays their views on the suitability of the outcomes for the tasks they needed these competencies for.

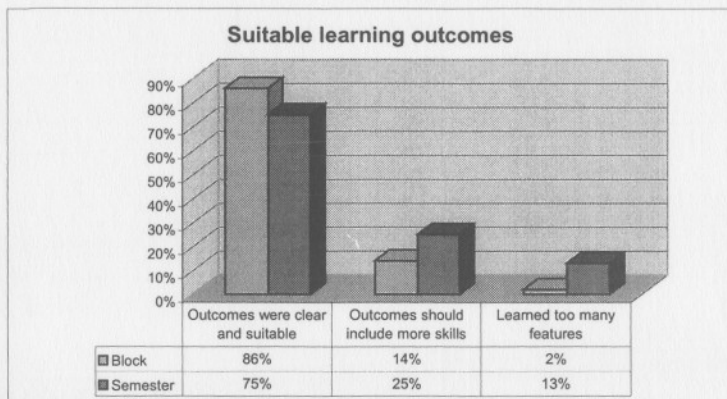


Figure 4.3 Learners' views on learning outcomes suitability for task

Interviews with four lecturers in the Department: Food, and results from the questionnaire, revealed that learners who attended the block module, were more likely to integrate their computer competencies in doing assignments in other subjects than did those who attended the semester course. This was due to the fact that the learners obtained these competencies early enough in the semester. Lecturers also reported that peers, who completed the block module, enthusiastically

facilitated those who attended the semester course. Figure 4.4 indicates the success rates and the learners' ability to integrate computer competencies for the completion of assignments in other subjects.

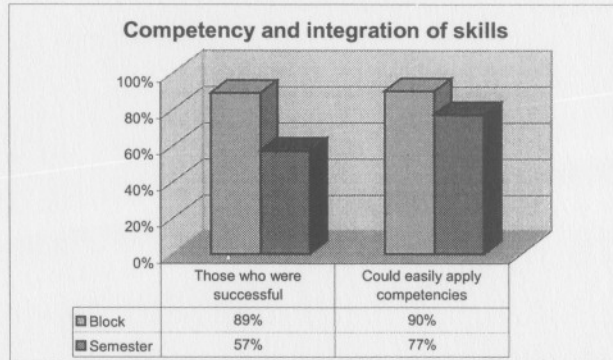


Figure 4.4 Learners' success rates and their ability to integrate computer competencies into other subjects

Marks for these assignments did not contribute to the final mark for EUC. During the interviews, lecturers in the Department: Food, pointed out that they would like to be more involved in the EUC curriculum and suggested, that lecturers from both departments assess assignments in future. After thorough planning in co-operation with the lecturers in the Department: Food, an advanced module was implemented over one semester in 2002, in which databases, Internet searches, E-mail and presentations were integrated in an authentic way, and from February 2003, co-operative assessment between lecturers in both departments, was introduced with a new group of second-year learners.

A post-assessment was introduced during February 2002 in order to assess the learners on their word processing and spreadsheet competencies at the start of their second year of study. Importantly, the results indicated in Figure 4.5, show that the learners remembered only what they practically had to integrate in assignments. No

spreadsheet competencies were required for these assignments (Janse van Rensburg & Vermeulen, 2002a).

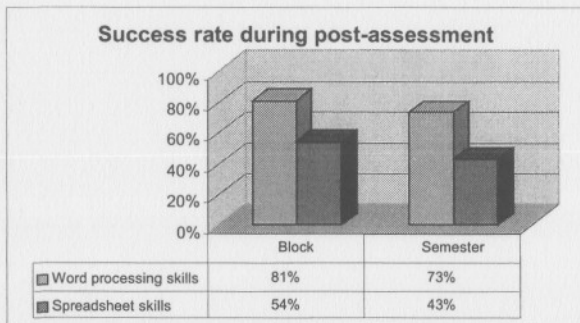


Figure 4.5 Retention of competencies at the start of learners' second year

4.7.2 Assessment practices for the module, fosters learning within the OBE framework

In an OBE system, learners should be provided with as many opportunities as are reasonably possible to demonstrate achievement of outcomes. The most appropriate time for such demonstrations, is when learners believe that they have mastered the outcomes to an acceptable standard. This allows the learners to get feedback on their learning and to plan goals for the next stage of their learning (Killen, 1997:30).

Recognition of prior learning (RPL) is the granting of credit for a unit of learning on the basis of an assessment of formal and non-formal prior learning or experience, in order to in this way establish whether the learner possesses the capabilities specified in the outcomes statement (SA, 2002:4). At the time of the case study, the Technikon did not yet have an RPL system in place to assess non-formal learning and none of the learners could provide evidence of any accredited courses that they had completed successfully, in order for them to gain credit for the EUC module. A

practical pre-assessment, which integrates all units, was introduced in order to reward those competent learners who progressed speedily, avoiding wasting time by having to go through work that they already knew. The three learners who completed the pre-assessment successfully, gained credits and were exempted from classes. They were, however, allowed to make use of microcomputer facilities for the rest of the semester.

It is a challenging endeavour to implement continuous assessment over a short period of two weeks. Freeman and Lewis (1998:33) advise against the offering of summative assessment only at the end of short modules, reducing the learners' opportunities to learn from their first attempts, or denying them a second chance to succeed. Learning and assessment are inextricably linked, therefore different approaches were utilised in order to assess whether teaching and learning could succeed in reaching the outcomes. Assessment processes can either encourage passive, reproductive forms of learning, or provide learners with an interpretation of how the task is related with the total experience of the learning programme. Learners learn best through experiences they find meaningful and valuable. When they engage actively in learning, they are encouraged to reflect on their experiences, and to communicate with others about the things they are learning. Assessment in an OBE system should embody all these principles, so that it becomes just as much a part of the learning process as any formal instruction (Killen, 1997:30).

Formative assessment rests on the principle of continuous assessment of learners' work on a regular, often daily, basis. Apart from remedial action that lecturers can implement to enhance learning, it also helps learners to reflect on and improve on their own performance (Freeman & Lewis, 1998:32; Van der Horst & McDonald, 1997:168-169; Cole & Chan, 1994:455). Due to the accelerated learning programme, formative assessment was conducted only informally, without formal class tests or marking exercises. Instruments such as peer discussions, practical exercises, and self-assessment through observation and reflection, were implemented. The reflective and self-regulated nature of the learning/teaching strategy, which was developed, enabled learners to succeed in two weeks' time

(Janse van Rensburg & Vermeulen, 2002b). Through self-assessment, learners become active partners in their own assessment in an authentic way through reflection on and judgement of their own achievements, while adopting strategies for self-improvement and effective time-management (Killen, 1997:30; Van der Horst & McDonald, 1997:188; Le Grange & Reddy, 1998:19). This was achieved through guiding learners to check their own performance against outcomes in their workbook in order in this way, to determine their progress and arrive at conclusions about future actions.

Summative assessment is conducted at the end of a learning unit or course and usually takes the form of a test, an examination, or a portfolio as conclusion of the module or unit of work, usually for accreditation or profiling purposes (Freeman & Lewis, 1998:32; Van der Horst & McDonald, 1997:172; Cole & Chan, 1994:455). During the traditional semester course for EUC, learners have three practical summative assessment opportunities, each with equal weights, of which the average counts as the final course mark. A minimum average mark of 50% is required to obtain credit for the course. Learners, who cannot save their work on 3½" floppy disks, receive zero marks, as in most certification examinations. Learners, who 'fail', have to repeat the course in their second year of study at the Technikon, because there are no re-write opportunities. Conversely, those learners who attended the block module, did three practical summative assessments, of which the first two counted 25% each and the last assessment, which assessed all the work, counted 50%, in order to allow learners to demonstrate their learning progressively over a period of time. For example, learners, who saved their work on the hard disk instead of on the 3½" floppy disk, received marks for what they could do, and only lost marks for not being able to use a floppy disk.

In certification examinations, such as the ICDL, tests are not returned to learners after assessment. The result is, that learners (or candidates) never get feedback on their incompetence. Cole and Chan (1994:215) define feedback as being information returned to individuals about the adequacy of their actions. It motivates learners to focus on specified goals and to improve their knowledge and skills in

particular areas. In the EUC module, learners experience continuous feedback through reflections from peers, through exercises, from the lecturer, and through practical summative tests that are either marked in the presence of the learner, or handed out with remarks written on the mark sheet. Furthermore, learners experience learning as a lifelong process through assignments in successive years, which require from them to scrutinise the advanced application-software features.

4.8 CONCLUSIONS AND RECOMMENDATIONS

The task of higher education institutions in SA is to develop competent learners within the framework of OBE, so that they are both capable and employable. In this study, the researcher developed a block module for the discipline EUC in which all the assessment is underpinned by the criteria of the learning outcomes. Further learning is facilitated by means of both summative and formative assessment, during which cumulative judgements of the learners' computer competencies are made. In contrast to once-off performance tests on fragments of the work, the continuous formative and summative assessment opportunities enhance the development of hands-on skills.

The following research findings established that assessment in the EUC module is conducted as planned.

- It is possible to assess competencies as prescribed by the ELO of the qualification through integration.
- It has been established, that the integration of different units of the module in other learning experiences, is required in order for learners to retain what they have learned.
- The accelerated nature of the block module brought about a tremendous increase in teaching and learning activities over a short period of time, which makes it difficult to implement a wide variety of formative assessment methods.

- The holistic approach to assessment provides lecturers with ongoing feedback about the learners' progress and ability to apply competencies in new situations. Lecturers provide learners with feedback after each summative assessment, which motivates further learning.
- Learners get feedback on their performances through self-assessment against clearly formulated outcomes. These reflections encourage the learners to perform on higher levels after each assessment, leaving them better equipped as a result thereof.

The researcher views curriculum development as an ongoing process and will undertake further actions in order to implement integrative assessment in advanced modules. There are, however, facets of this philosophy that need the consent of the other departments that the DCEU serves. It is recommended, that further research on the following matters should be performed.

- Activities should allow for differences in the evidence collected from different learners. The evidence should show, whether learners could effectively choose what part of their learning is needed to solve a problem or to do a task, and then to use that learning to complete the task successfully. The success of this method relies on the professional judgement of the lecturer against a set of criteria that have been clearly communicated to the learners, before the task is assigned.
- The need for moderation purposes demands, that continuous assessment is reliable and fair. All formal assessments (which contribute to final judgements) should be moderated for consistency between lecturers in the department without undermining their personal teaching style and creative spirit. In a large department with thousands of learners, this is a complex task.

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CHAPTER 5

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This study focused on a case study during which a modular curriculum for computer competency courses for technikon learners was designed and implemented, and particularly reflects on the implications that the implementation of the module with regard to learning, teaching and assessment, has had on the curriculum. The case study involved all first-year learners in the Department: Food at the VTT, who were enrolled for EUC. In this chapter, a summary of the research is presented. The findings with regard to the research objectives mentioned in Chapter 1 and the results of each of the corresponding articles (Chapters 2-4) are summarised. Specific problems that were experienced are reflected on and finally, recommendations based on the research findings are presented.

The next section summarises the findings in accordance with the stated research objectives and research questions as presented by means of three articles.

5.2 RESEARCH FINDINGS WITH REGARD TO SPECIFIC RESEARCH QUESTIONS

Chapters 2-4 present the readers with three articles. Each article respectively states the problem and the research questions; provides a literature study; and presents a detailed research design, methodology, data analysis and interpretation. The research findings and the problems experienced with regard to each article are concluded on in the following paragraphs.

5.2.1 Modularisation of the EUC module fosters capability and orientation in the workplace through the integration of knowledge and skills

The curricular innovation of the case study took place within a matrix of educational, political, economical, institutional and administrative variables, which had an influence on the eventual outcome of the case study. The underlying rationale was, to provide learners with prior knowledge and to empower them to develop into computer competent users who are able to integrate these skills in their other courses and subsequently, in the workplace. A block module for the discipline EUC was developed and implemented over two weeks at the start of a semester before the learners commenced with their other classes. One group of learners attended the block module, while another group attended the traditional semester course.

- The high success rate and positive responses gathered from questionnaires, show that those learners who attended the block module, were open to learning in new ways and that there were sufficient formative assessment opportunities in the course of the block module for them to successfully apply their competencies in two other courses.
- The average assessment results of those learners, who attended the block module, exceeded that of the semester course learners, revealing that learning can be improved within a block module.
- An important fact revealed by post-assessment, is that those learners, who attended the block module, retained the computer competencies, which they had to utilise practically for completing assignments in two other courses, to a larger degree than did the semester-group.

This case study involved a specific lecturer, resources and group of learners taken out of the normal schedule. Normal schedules were thereby disrupted, because not all departments have modularised their qualifications yet, proving that in order for modularisation to be implemented successfully, all associated departments will have to abandon the rule of time and fully modularise their qualifications in terms of smaller blocks than semesters or quarters. Because the module is presented to

more than 15 other departments at the Technikon, scheduling the module in smaller blocks than semesters or quarters will thus remain a problem until all departments have fully modularised their qualifications.

5.2.2 Action research and experiential learning are strategies that may be implemented in order to ensure that learners will achieve the learning outcomes within a block module

Enabling learners to learn effectively within the accelerated context of a block module, requires a lot of energy, trust, and enthusiasm from both the lecturer and the learners. Action research, combined with electronic demonstration of the outcomes, enables the lecturer to facilitate and lead in a journey of discovery, while the learners focus on the outcomes through a process of experiential learning, including reflection-on-action.

- Results indicated, that learners who attended the block module, had confidence in their own abilities to succeed, in contrast with the learners from the semester group. This shows, that the learners perceived the learning/teaching strategy as outcomes-based.
- Almost all the learners perceived the lecturer as someone who motivated and empowered them towards success, in contrast with those learners who were taught traditionally. It may thus be deduced that the action research strategy was implemented successfully as a teaching strategy.
- The competency rates of the two groups differ significantly. It was found, that the accelerated experiential learning strategy enhanced the learners' retention, comprehension, and ability to integrate knowledge and skills to their advantage during the semester that followed the module. This fact underlines the importance for lecturers to collaborate with and motivate lecturers in other departments to expect from learners to integrate computer competencies as from the first year of study at a technikon.

The study has however, identified problematic issues within the accelerated learning context. Time for the lecturer to reflect, was restricted during the course of the module and only carefully re-planning of daily activities allowed for reflection on actions. Time for learners to reflect on outcomes, was possible, but time for deeper reflection was possible only by the end of the course, which was encouraged by means of questionnaires.

5.2.3 An integrative approach to continuous assessment fosters computer competency

The task of higher education institutions in SA is to develop competent learners within the framework of OBE, thus enabling them to implement their knowledge and skills in the workplace. In the block module for the discipline EUC, assessment is underpinned by the criteria of learning outcomes. Further learning is facilitated by means of both summative and formative assessment, during which cumulative judgements of the learners' computer competencies are made. In contrast to once-off performance tests on fragments of the work, the continuous formative and summative assessment opportunities enhance the development of hands-on skills.

- Specific outcomes for the module have been formulated, in order for these to contribute to the ELO of the qualification. It was found that this approach makes it possible to assess competencies in a continuous and integrative manner.
- The research showed, that the integration of different units of the module in other learning experiences is required in order to allow learners to retain what they have learned.
- The holistic approach to assessment provides lecturers with ongoing feedback about the learners' progress and ability to apply competencies in new situations. Collaboration with the lecturers in other departments encourages them to discuss the development of the learners and to construct innovative ideas on integrating computer competencies in other learning experiences.

- Learners get feedback on their performances through self-assessment against clearly formulated outcomes, as well as after each summative assessment, which again motivates further learning. The fact that learners made use of computer laboratories after hours mainly for practicing, doing assignments and learning new skills, illustrates their motivation.

The accelerated nature of a block module brings about a tremendous increase in teaching and learning activities over a short period of time, which makes it difficult to implement a wide variety of formative assessment methods. However, the implementation of reflective learning and teaching strategies fosters self-assessment and aids learners to focus on the outcomes of the module.

In the following section, these findings are summarised and reflected on, in order in this way to provide the reader with a comprehensive view of the findings of the study.

5.3 CONCLUSIONS AND REFLECTIONS

The researcher developed a flexible, outcomes-based curriculum in which learners are able to demonstrate computer competencies, as well as their ability to integrate these skills in other learning experiences. The need for learners to become computer competent before the start of their other courses in the first year of study at a technikon, has been motivated.

Implementing the modular curriculum, proved to take longer than originally anticipated. The successful implementation of educational innovations is based on a strategic approach to managing change. The action research cycles of plan, implement, observe, reflect and re-plan, provide researchers the flexibility to intervene and to move beyond the attachment to practical solutions, in order for them to resolve immediate problems as they occur, and to plan for improvement.

In the following paragraphs conclusions with regard to the organisation and presentation of the module, learning and teaching strategies, and assessment, are presented.

5.3.1 Organisation and presentation of the module

The module fits into the vertical organisation on NQF level 5 by targeting 'non-science' learners from a wide learner population requiring minimal pre-requisites. It is regarded as a generic foundational module flexible enough for macro-level horizontal integration into other subjects or modules.

Clearly defined outcomes provide lecturers with a freedom to present the module according to individual styles, while they have the assurance of quality control, namely, that learners will achieve the outcomes and be able to integrate their knowledge and skills in their respective programmes and future careers.

5.3.2 Teaching and learning

The researcher investigated different didactic strategies in order to ensure that learners will achieve the learning outcomes over the short period of two weeks. Action research and experiential learning strategies were implemented in order to facilitate self-reflection, collaboration and integration. There is no guarantee, that all the lecturers involved in modularisation will adopt the teaching strategy. They might not adopt new or alternative methods of teaching and be motivated to make them work, and may consequently revert to a conventional style of teaching. Furthermore, presenting a block module, requires longer hours of concentration and demands a tremendous amount of energy, which is exhausting, should accelerated learning techniques not be implemented.

Learners are not necessarily open to learning in new ways. Co-operative learning requires co-operation between two or more learners, while reflection is a technique requiring of learners to critically analyse the effects of their actions, with the ultimate goal of improving practices. If a learner disagrees with or dislikes these techniques,

these methods' effectiveness can quickly disintegrate. However, research shows that the competency rates of the two groups differ significantly. Learners who attended the block module, experienced the learning/teaching strategy positively and the lecturer observed, that they participated actively in the accelerated learning process. The finding that the accelerated experiential learning strategy enhanced the learners' retention, comprehension, and ability to integrate knowledge and skills to their advantage during the semester, which followed the presentation of the EUC module, is of particular importance.

5.3.3 Assessment

The modular, outcomes-based curriculum for computer competency courses, makes provision for more continuous and formative assessment opportunities on a daily basis. This, however, requires remarkable planning and collaboration, which places a significant amount of responsibility on the lecturer. Planning, scheduling and compilation of summative assessments have to be done in time and before the start of the module.

Research proved, that an integrated approach to assessment offers computer competency learners the optimal learning experience. A challenge is, to motivate lecturers to adopt this approach and to develop alternative methods of assessment, so that they do not revert to, or continue to test only skills.

Integrative assessment of computer competencies, combined with the reflective learning/teaching strategy, provides learners with regular feedback on their abilities to demonstrate capability, employability and orientation in their other courses, as well as in the workplace.

In the following section, final recommendations with regard to the research findings are made.

5.4 RECOMMENDATIONS

The following recommendations are made with regard to the organisation of the module; integration; assessment and further training.

- It is recommended, that the EUC module is adapted as a generic module and offered as a foundation course to all learners who cannot demonstrate prior learning of the computer competencies as prescribed by the module outcomes, and who enter the Technikon on the NQF level 5.
- It is further recommended, that advanced modules succeed the foundational module, in order to satisfy specific needs of different departments during which learners are assigned tasks, collaboratively designed and assessed by computer competency lecturers and lecturers in other departments.
- If the continuous and integrated assessment of computer competency modules is to be implemented meaningfully and successfully, applicable assignments need to be well planned and designed, in co-operation with lecturers in other departments. Activities should allow for differences in the evidence collected from learners enrolled from different programmes. Lecturers should make professional judgements against a set of criteria that have been clearly communicated to the learners, before the tasks are assigned.
- For quality control measures, summative assessments and assignments with the same standards for the different groups of learners should be planned and compiled on an annual basis, and should be moderated.
- Learning guides and learning material must be compiled comprehensively in order to guide the learners through the learning process. There should be no doubt in the minds of learners with regard to the outcomes that they should reach, and how and when they should realise these outcomes.
- The new modular structure requires from lecturers to adopt a philosophy towards teaching and classroom management that differs from the conventional classroom style and they may not be motivated to make the paradigm shift to

implement modern, outcomes-based teaching and assessment methods. It is, therefore, essential that they be trained in OBE competencies.

- For a block module to be presented successfully, lecturers need extensive training in meta-cognitive, reflective teaching skills and accelerated learning techniques, such as the incorporation of a variety of physical activities, music, and relaxation exercises.

5.5 CONCLUSION

In this chapter, a judgment is made with regard to the research findings, and recommendations are made on the grounds of the research findings. This case study enables professionals to further develop their knowledge and understanding of what is involved in the development and implementation of a block module, in the light of current educational change.

A significant number of learners who attended the block module, were successful with the block module, doubtless because of the dynamic action learning process and the fact that continuous, integrative assessment methods supported hands-on learning. By the start of the learners' other classes in their first year of study, they were already able to integrate their computer competencies in two other courses. In their second year of study, it was found, that they also retained the word processing competencies, which they used to complete their assignments. It is, therefore, of paramount importance for those lecturers who present computer competency courses, to collaborate with lecturers in other departments in assigning to learners tasks to complete, requiring from them to apply their computer competencies.

Scheduling of block modules in such a way, that resources are optimally utilised, needs extensive managerial support and requires from all departments to have been fully modularised. Furthermore, the academic timetable will have to be centrally designed in order to establish the flexibility it requires.

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Appendix A

OPEN-ENDED QUESTIONNAIRE TO THE WHOLE GROUP OF LEARNERS

Dear Learner

As I have explained, we are in the process of modularising End-user Computing for the National Diploma: Food and Beverage Management. This means, that half of you are going to attend the module full day for two weeks and the other half will attend three hours per week for one semester.

Your expectations and concerns are of great value to us, because we want to offer our learners the best learning experiences possible.

Would you be so kind to complete the questionnaire below on the paper provided? Your opinions are confidential and you do not have to state your name.

Mrs G Janse van Rensburg
Office no T006
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QUESTIONNAIRE

1. What are your expectations of this computer competency course?
2. Do you have any concerns doing the module full day over a period of two weeks, and if so, please write them down.

Appendix B

QUESTIONNAIRE TO THE TWO-WEEKS GROUP AT THE END OF THE BLOCK MODULE

Dear Learner

You attended the End-user Computing module full-day for two weeks, while the rest of the learners will continue to attend three hours per week for the rest of the semester.

Your expectations and concerns are of great value to us, because we want to offer our learners the best learning experiences possible. Would you be so kind to complete the questionnaire below in the space provided? Your opinions are confidential and you do not have to state your name.

Mrs G Janse van Rensburg
Office no T006
Department Computer End-using
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QUESTIONNAIRE

1. Now, at the end of the two weeks, do you feel that your expectations have been fulfilled?

Yes	No	Unsure
-----	----	--------

2. If not, which expectations were not fulfilled? _____

3. You may have had some concerns at the start of the module. Indicate with an **X** how strongly you Disagree (1-2) or Agree (3-4) with the following statements.

1-Strongly disagree; 2-Disagree; 3-Agree; 4-Strongly agree

3.1	The hours were too long and tiring	1	2	3	4
3.2	I will remember what I have learned	1	2	3	4
3.3	I need more practice before I can apply my competencies	1	2	3	4

3.4	I think I have succeeded	1	2	3	4
3.5	If I have not succeeded, I would like to rewrite soon	1	2	3	4
3.6	My trust in the lecturer proved to be right	1	2	3	4
3.7	It would be better to do this module parallel with my other subjects	1	2	3	4

4. Please write down any other concerns about the module that you still have:

Appendix C

QUESTIONNAIRE TO THE WHOLE GROUP OF LEARNERS AT THE END OF THE SEMESTER

Faculty of Applied and Computer Sciences Department of Computer End-using



MODULARISATION OF END-USER COMPUTING

Dear Learner

As you have been informed during January 2001, the Department: Computer End-using is considering modularisation i.e. offering a block module full day for two weeks. Some of you attended the block module, while others attended three hours per week for the whole semester.

Your expectations, concerns and experiences are of great value to us, because we want to offer our learners the best learning experiences possible. It is now a suitable time to reflect on our practices of the past semester.

Would you be so kind to complete the questionnaire below in the space provided? Your opinions are confidential and you do not need to state your name.

Thank you for your co-operation.

Yours sincerely

(Mrs) GJ van Rensburg

QUESTIONNAIRE

Please tick the appropriate box. You should make only one choice, unless it is stated otherwise.

1. Attendance

1.1	I attended the block module (full-day for 2 weeks)	
1.2	I attended the semester course (3 hours per week for the whole semester)	

2. I understood the reasons for these attendance arrangements

2.1	Agree	
2.2	Disagree	

3. Performance of pre-assessment (pre-test)

3.1	I did not know about a pre-assessment (pre-test) opportunity	
3.2	I did the pre-assessment (pre-test)	
3.3	I did NOT do the pre-assessment, because I was not computer literate	
3.4	I did NOT do the pre-assessment, because I was unsure if I had <u>sufficient</u> knowledge and skills to be successful	

4. How often did you make use of the microcomputer labs after hours during the past semester?

4.1	At least once per week	
4.2	Three times or more during the semester	
4.3	Only once or twice during the semester	
4.4	Never	

5. For what reason(s) did you make use of the microcomputer labs after hours during the past semester? (For this question, you may select more than one answer)

5.1	To practice the computer skills I have been taught	
5.2	To do assignments	
5.3	To learn new skills	
5.4	To practice for assessment (tests)	
5.5	Other (please specify)	

6. For what reason(s) did you not make use of the microcomputer labs? (Please state in your own words).

7. How often did you attend the End-user Computing lectures?

7.1	I never missed a lecture	
7.2	I had only been absent once or twice	
7.3	I skipped more than two lectures.	

8. Please state your reason(s) for the answer in question 7.

9. Do you feel that you achieved the required outcomes for the End-user Computing course? (i.e. that you have passed End-user Computing)

9.1	Yes	
9.2	No	
9.3	Unsure (please specify)	

10. Tick the statement that most likely describe the way you experienced your learning process

10.1	The teacher (lecturer) persistently helped me to focus on outcomes (particular targets)	
10.2	I was unsure of what was expected from me	
10.3	I was motivated, because I had a chance to demonstrate what I have learnt	
10.4	I never got the impression that I am able to succeed	

11. Tick the statement that most likely describes the way you experienced the content that was presented to you

11.1	I learned too many features that I will never use again	
11.2	The learning content did not provide me with sufficient knowledge and skills to apply in my other subjects	
11.3	The learning outcomes (objectives) were stated clearly enough for me to know what I was heading for	
11.4	I was not able to see the value of End-User Computing for my future studies	

12. The major task of the teacher (lecturer) should be to

12.1	To assist me step-by step in solving problems so that I can succeed	
12.2	To facilitate (help) me so that I will be able to work on my own	
12.3	To be well prepared so that he/she can enliven content to learners	
12.4	To provide me with all the information I need to pass End-user Computing	

13. My teacher can best be described as someone, who

13.1	guides me to succeed	
13.2	allows me to make and correct errors, so that I can learn from the process	
13.3	is a provider of information and who drills me until I can apply a skill	
13.4	expects from me to learn at the same pace as all the other learners (students)	

14. Assessment: Tick the statement that most likely describes the way you experienced the assessment (tests) that you performed

14.1	I had enough assessment opportunities (tests) to demonstrate my knowledge and skills	
14.2	I was assessed only summatively, in other words, I performed only tests	
14.3	I received clear feedback in which areas I did not reach the required standard yet	
14.4	I had ample opportunities to evaluate myself against the outcomes (objectives)	

15. Time frame (For this question, you may select more than one answer.)

15.1	There was sufficient time to complete the learning content	
15.2	There was not enough time to get feedback from my teacher (lecturer) on how successful I am	
15.3	The time allocated per day was too long and tiring	
15.4	I will never remember what I have learnt in End-user Computing	

16. Could you apply your knowledge practically in other subjects during the semester?

7.1	Yes	
7.2	No	

17. Please state your reason(s) for the answer in question 16

18. I made use of the microcomputer labs after hours

18.1	on my own initiatives	
18.2	only because my teacher (lecturer) instructed me to do so	
18.3	other reasons (please specify)	

19. Were there sufficient facilities to practise after hours during the semester?

19.1	Yes	
19.2	No	

20. Please state your reason(s) for the answer in question 19

21. How often will you need to revise the work to be able to remember what you have learnt in End-user Computing?

21.1	Never again – I will always remember the work	
21.2	I will need to use my competencies at least once a month	
21.3	Every semester for doing assignments in other courses	
21.4	Other (please specify)	

22. How do you think the module should be scheduled?

22.1	At the start of each semester as a block module for the duration of two weeks	
22.2	It should be offered quarterly (four times per year) for the duration of the quarter	
22.3	It should be offered each semester for the duration of the semester	
22.4	Other suggestions (please specify)	

23. Please write down your own understanding of the reasons for scheduling the course at the start of the semester as a block module scheduled over two weeks

24. If you attended the block module (full day for 2 weeks), do you think that having the skills early enough gave you an advantage over learners (students) that attended the semester course?

24.1	Yes	
24.2	No	

25. Please state your reason(s) for the answer in question 24:

Appendix D

Faculty of Applied and Computer Sciences

Department of Computer End-using



MODULARISATION OF END-USER COMPUTING

SEMI-STRUCTURED INTERVIEW

(With lecturers from the Department: Food, who taught other subjects to the learners involved in the research on modularisation).

Some learners enrolled for B Tech: Food and Beverage Management, attended the block module offered full-day for two weeks, while others attended three hours per week for the whole semester.

1. Did you make use of the knowledge and skills of the learners who attended the block module?
 - If yes, how?
 - If not, why not? Discuss reasons.
2. Were you informed that learners might make use of the microcomputer labs after hours?
 - If yes, did you encourage the learners to make use of the facilities?
 - If not, discuss consequences and possible reasons.
 - Find out whether the lecturer at all required any typed assignments or not.
3. Were there any problems in using the microcomputer lab facilities?
 - If yes, discuss and take note of problems.

4. How soon did you start to require from learners that assignments should be typed by using a microcomputer?
5. Did you notice any difference in the computer competency levels of the distinctive learners?
 - If yes, please describe the difference.
6. Did the difference in computer literacy levels make it difficult for you to require a certain standard for assignments?
7. How did you assess assignments, keeping the difference in computer competency levels in mind?
8. Did the learners have sufficient knowledge and skills to meet your requirements for typed assignments?
 - If yes, discuss the quality of the typed assignments
 - Ask to view some of the assignments
 - If not, discuss reasons and requirements.
9. How do you feel about integration of End-user Computing with the subject/course you teach?
10. Did you experience a difference in the learners' orientation to their work, after the extra two weeks that they have spent on campus before the start of their other classes, and if so, to which effect?