# Digital Versatile Disc as an Information and Communication Technology variant to support Geography teaching and learning

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## SUMMARY

**Key words:** *ICT in Geography teaching, DVD-technology, ICT and developing countries, ICT variants. Teaching with computers, DVD and Geography, academic achievement, academic performance, lecture vs ICT, multimedia learning, resource-based learning.*

The application of Information and Communication Technology (ICT) as supportive tool in teaching and learning within the framework of the radical change that Outcomes Based Education (OBE) has created, pervades and consequently alters the pedagogy and methodology of Geography teaching. Geography is a subject in which ICT can make a definite and worthwhile contribution and it is, therefore, important that Geography educators know how to harness the benefits of ICT for their learners. Apart from the general availability of ICT to fulfil the requirements of the curricula, there are pressures from the world outside the classroom in the form of professionals who utilize Geography in their profession, such as town planners and meteorologists, who utilise new technology such as GIS, GPS, satellite images, radar summaries, air charts and meteograms as an integral part of their work.

The Internet, the World Wide Web and CD-Rom are used progressively as resource-based and communication tools in teaching and learning throughout the world. The challenge to utilise ICT in Geography teaching and learning occurs in a world experiencing increasing disparities between the rich and poor, among and within nations. For example, while 72.7% of Americans currently use the Internet, only 6.4% of South Africans have access to and use the Internet. A solution for sufficient ICT support in teaching and learning for developing countries is to focus on ICT variants that are affordable and that will sustain movement toward fulfilling development objectives. Developing countries (such as the RSA) need to consider alternatives to ICT that maximise the impact of ICT and that entail balancing investment in computers with investment in other technologies that might be cheaper and equally effective. The use of alternative ICT variants must, however, be globally competitive, but at the same time be cost-effective. The ability, versatility and low cost of an ICT variant such as the Digital Versatile Disc (DVD) suggest that it can serve this purpose.

ICT supports teaching and learning in Geography in many ways and has an impact on the quality of learners' learning experience and the depth of their learning. It can be a tool for inquiry learning, a resource for obtaining secondary source material, an aid in measuring physical events and situations, models real-world situations, helps to communicate and present information, improves efficiency and pace of workload, provides resources and structure to support learning independently of the educator and improves the quality of task outcomes for learners.

The introduction of OBE in South Africa since 1994 has also encouraged learner-centred teaching and learning and has required a paradigm shift away from the traditional content-based transmission model of teaching and learning.

The purpose of this study is to:

- determine whether or not the DVD method can support the teaching and learning of Geography teacher students effectively;
- determine how the DVD alters the format, structure and number of traditional formal Geography lectures;
- determine what the nature of the information on the DVD must be in order to be perceived by the students effectively;
- investigate the effect of the utilisation of the DVD on the academic performance of Geography teacher students; and
- develop a model for the effective integration and utilisation of the DVD in full-time Geography teaching and learning.

An action research method constituted the backbone of this study. The action research included a combined qualitative and quantitative research method in the form of a cross-sectional study as part of a developmental research method, in order to develop and evaluate a proposed model for the effective integration and utilisation of the DVD in Geography teaching and learning. The participants in this study included the entire population of the full-time, second-year students of the Economic Geography module, GEOH251 of 2004, 2005 and 2006 of the B.Ed (teaching degree) of the North-West University (Potchefstroom Campus).

The results of the study can be summarised as follows:

This study indicated that the majority of the GEOH251 students were positive regarding the integration of the DVD in Geography teaching and learning. The DVD-method teaching approach challenges lecturers and students to fulfil new roles within the teaching and learning environment.

The results of this study indicate the following:

- The integration of the DVD method can support the teaching and learning of Geography teacher students effectively.
- The utilisation of the DVD, together with a seminar format with a specific procedure, enhances the teaching and learning of Geography.
- The DVD with all the different types of information included thereon was well received by the Geography students and was deemed effective.
- The integration of the DVD into Geography teaching and learning evidently did not result in poorer academic performances of students in the GEOH251 module.
- The proposed model provides clear guidelines on how to integrate the DVD in Geography teaching and learning. It explains how the DVD should be compiled, what to include and how to employ it effectively in conjunction with seminars. It also describes the transition of formal contact sessions to seminars, which occur less frequently than traditional contact sessions, but with regular weekly intervals, as well as explains the seminar proceedings, interactions and timeframes.

The DVD can be integrated into Geography teaching and learning effectively if the procedures, steps, and actions, as expounded in the proposed model, are applied. The advantages of the DVD as ICT variant in Geography teaching and learning can be clearly seen, especially if it can be implemented in developing countries.

# OPSOMMING


**Digitale Veelsydige Skyf as 'n Inligtings- en Kommunikasietegnologie variant ter ondersteuning van Geografie-onderrig en -leer.**

**Sleutelterme:** *IKT in Geografie onderrig, DVS tegnologie, IKT en ontwikkelende lande, IKT variante. Onderrig met behulp van rekenaars, DVS en Geografie, akademiese prestasie, lesings vs IKT, leer met behulp van multimedia, hulpbrongebaseerde leer.*

Die toepassing van Inligtings- en Kommunikasietegnologie (IKT) as ondersteunende instrument in onderrig en leer binne die raamwerk van radikale verandering wat teweeggebring is deur Uitkomsgebaseerde Onderrig (UGO), deurtrek en verander gevolglik die pedagogiek en metodologie van Geografie onderrig. Geografie is 'n vak waarin IKT 'n definitiewe en waardevolle bydra kan lewer, en dit is daarom belangrik dat Geografie opvoeders sal weet hoe om die voordele van IKT aan te wend in die onderrig van leerders. Buiten die algemene beskikbaarheid van IKT om aan die vereistes van die kurrikulums te voldoen, word druk van die wêreld buite die klaskamer uitgeoefen in die vorm van professionele Geograwe, soos stadsbeplanners en meteoroloë, wat nuwe tegnologie soos GIS, GPS, satelietbeelde, radaropsommings, lugkaarte en meteogramme aanwend as integrale deel van hulle werk.

Die Internet, Wêreldwye Web en CD-Rom word progressief gebruik as hulpbronge-baseerde - en kommunikasieinstrument in onderrig en leer dwarsoor die wêreld. Die uitdaging word gestel om IKT in Geografie-onderrig en -leer aan te wend in 'n wêreld wat toenemende uiteenlopendheid ervaar tussen rykdom en armoede, beide tussen en binne nasies. Byvoorbeeld, 72.7% Amerikaners maak huidiglik gebruik van die Internet, terwyl slegs 6.4% Suid-Afrikaners toegang tot die Internet het en dit gebruik. 'n Oplossing vir genoegsame IKT ondersteuning in onderrig en leer vir ontwikkelende lande is om te fokus op bekostigbare IKT variante wat die beweging na die vervulling van ontwikkelingsdoelwitte sal bewerkstellig. Ontwikkelende lande (soos die RSA) moet alternatiewe vir IKT oorweeg wat die impak van IKT sal maksimeer en wat 'n balans tussen 'n belegging in rekenaars en 'n belegging in ander goedkoper, ewe effektiewe tegnologieë, sal meebring. Die gebruik van alternatiewe IKT variante moet egter terselfdertyd globaal kompeterend en koste-effektief wees. Aan die hand van

die vermoë, veelsydigheid en bekostigbaarheid van 'n IKT variant soos die Digitale Veelsydige Skyf (DVS), sal dit waarskynlik hierdie doel kan bereik.

IKT ondersteun onderrig en leer in Geografie op verskeie wyses en het 'n impak op die kwaliteit van leerders se leerervarings en die diepte van leer. Dit mag dien as 'n instrument vir ondersoekende leer, 'n hulpbron in die verkryging van sekondêre bronmateriaal, as 'n hulpmiddel in die meet van fisiese gebeurtenisse en situasies, en dit modelleer lewenswerklike situasies. Verder dien dit as hulpmiddel in die kommunikasie en aanbieding van inligting, verbeter doeltreffendheid en die tempo van die werkslading, verskaf hulpbronne en struktuur ten einde leer te ondersteun wat onafhanklik van die opvoeder plaasvind en verbeter die kwaliteit van taakuitkomste vir leerders.

Die bekendstelling van UGO in Suid-Afrika sedert 1994 moedig ook leerdergesentreerde onderrig en leer aan en vereis 'n paradigmaskuif, weg van die tradisionele inhoudsgebaseerde transmissiemodel van onderrig en leer.

Die doel van hierdie studie is om:

- vas te stel of die DVS metode die onderrig en leer van Geografie onderwysstudente effektief kan ondersteun;
- vas te stel hoe die DVS die formaat en struktuur van, en die aantal tradisionele, formele Geografielesings verander;
- vas te stel wat die aard van inligting op die DVS moet wees ten einde effektief deur die studente begryp te word;
- die effek van die gebruik van die DVS op die akademiese prestasie van Geografie onderwysstudente te ondersoek; en
- 'n model te ontwikkel vir die effektiewe integrasie en gebruik van die DVS in voltydse Geografie-onderrig en -leer.

'n Aksienavorsingsmetode het as rugsteun van hierdie studie gedien. Die aksienavorsing het 'n gekombineerde kwalitatiewe en kwantitatiewe navorsingsmetode ingesluit in die vorm van 'n dwarssnitstudie as deel van 'n ontwikkelings-navorsingsmetode ten einde 'n voorgestelde model vir die effektiewe integrasie en gebruik van

die DVS in Geografie-onderrig en -leer te ontwikkel en te evalueer. Die deelnemers in hierdie studie het die algehele populasie van die voltydse, tweede-jaarstudente van die Ekonomiese Geografie module, GEOH251 van 2004, 2005 en 2006, van die B.Ed (onderwysgraad) van die Noordwes Universiteit (Potchefstroom Kampus) ingesluit.

Die resultate van hierdie studie kan soos volg saamgevat word:

Hierdie studie het aangedui dat die meerderheid GEOH251 studente positief was aangaande die integrering van die DVS in Geografie-onderrig en -leer. Die DVS-meto-de onderwysbenadering daag dosente en studente om nuwe rolle te vervul binne die onderrig en leer omgewing.

Die resultate van hierdie studie het op die volgende gedui:

- Die integrasie van die DVS metode kan die onderrig en leer van Geografie onderwysstudente effektief ondersteun.
- Die gebruik van die DVS tesame met 'n seminaarformaat, met 'n spesifieke prosedure, verbeter die onderrig en leer van Geografie.
- Die DVS met al die verskillende tipes inligting wat daarin vervat is, is goed deur die Geografiestudente ontvang en is as effektief beskou.
- Die integrasie van die DVS in Geografie-onderrig en -leer het klaarblyklik nie swakker akademiese prestasie by studente in die GEOH251 module tot gevolg gehad nie.
- Die voorgestelde model verskaf duidelike riglyne vir die integrering van die DVS in Geografie-onderrig en -leer. Dit verduidelik hoe die DVS saamgestel moet word, wat ingesluit moet word, en hoe om dit effektief tesame met seminare aan te wend. Dit beskryf ook die verandering van formele kontaksessies na seminare, wat minder plaasvind as tradisionele kontaksessies, maar met gereelde, weeklikse intervalle, asook die verduideliking van seminaarverrigtinge, -interaksies en -tydsraamwerke.

Die DVS kan effektief geïntegreer word in Geografie-onderrig en -leer indien die prosedures, stappe en aksies, soos uiteengesit in die voorgestelde model, toegepas word. Die voordele van die DVS as IKT variant in Geografie-onderrig en -leer is ooglo-pend, veral indien dit in ontwikkelende lande geïmplimenteer kan word.

# CHAPTER 1

## PROBLEM STATEMENT AND RESEARCH PROGRAMME

### 1.1 INTRODUCTION

The quest for the utilization of Information and Communication Technology (ICT) in teaching and learning continues to pose a challenge for education systems around the world (Bishop & Shroder, 1995:1; Department of Education, 2003:13). Geography is a subject in which ICT can make a definite and worthwhile contribution and it is, therefore, important that Geography educators know how to harness the benefits of ICT for their students (Freeman, 1997:202). Nellis (1994:36) indicates that through ICT variants such as computer graphics, Geography computer software and simulations as well as Geographic Information Systems (GIS), Global Positioning Systems (GPS) and remote sensing, geography educators and students can address a broader range of spatial questions than was previously possible. Furthermore, the Internet and the World Wide Web, as the most commonly used ICT variants, are used progressively more as a resource and communication tool in teaching and learning throughout the world (Lundall & Howell, 2000:67; Stanfield, 2003:2).

Apart from the general availability of ICT to fulfil the requirements of curricula, there are pressures from outside the classroom in the form of professionals who utilize geography in their profession such as town planners and meteorologists who utilize new technology such as GIS, GPS, satellite images, radar summaries, air charts and meteograms as an integral part of their work (Freeman, 1997:202; Bishop *et al.*, 1993:102). Freeman (1997:202) and Fitzpatrick (1993:156) also states that apart from the context and concepts that make up the essence of educational Geography that remain relatively constant, the skills and techniques that underpin and contribute towards geographical understanding change more rapidly with times - changes in technology pervade the pedagogy and methodology of Geography.

ICT supports teaching and learning in Geography in many ways and has an impact on the quality of students' learning experience and the depth of their learning. It can be a tool for inquiry learning, a resource for obtaining secondary source material, an aid in measuring physical events and situations, models real-world situations, assists in communicating and presenting information, improves efficiency and pace of workload, provides resources and structure to support learning independently of the educator and improves the quality of task outcomes for pupils (Freeman, 1997:202; Hassell, 1996:77; Kennewell, 2004:26-27).

The introduction of Outcomes Based Education (OBE) since 1994 in the Republic of South Africa encourages learner centred teaching and learning and requires a paradigm shift away from the traditional content based transmission model of teaching and learning (Department of Education, 1997:30). With this new approach, the role of the educator has changed dramatically from that of knowledge transferors to facilitators of the learning act (Vermeulen, 1998:17). According to Kapp (1997:6), the OBE approach offers a supportive and stimulating environment with sufficient learning time and additional learning experiences to learners wherein learners can work and progress according to their own particular pace.

OBE as a new teaching and learning approach is the direct result of the shift in perspectives of teaching and learning and has been well received across the world (Húsen & Postlethwaite, 1994:3297). Various learning theories, such as the behaviourist and cognitive learning theories were developed in an attempt to better understand certain aspects of the learning situation. The behaviouristic view focuses on behavioural changes that often require a passive response from learners to different environmental factors. From behaviouristic perspectives, teaching and learning were viewed as being linearly connected. The teaching effort had to produce the required learning product (Gunter *et al.*, 1995:79, 91-93). The work of B. F. Skinner, for example, was based on the idea that humans learned from experience through the mechanisms of stimulus-response and operant conditioning. This implied a very limited role for the teacher and learner. As far as learning with ICT is concerned, behaviourism has been particularly

influential since the first examples of computer-aided learning (CAL) were based mainly on Skinnerian teaching machines (Kennewell, 2004:90).

At the same time as behaviourism was influential, Jean Piaget developed his theory of cognitive development. He emphasised the role of experience in learning. His key theoretical idea was the development of schematic structures in the mind through experience, which constituted understanding (Kennewell, 2004:90). Contrary to the behaviouristic view, a cognitive approach to learning emphasises that learning is an active, constructive, goal-orientated and self-regulated process that depends on the learner's thinking actions such as perception, contemplation, knowledge exposition and memory (Shuell, 1986:415).

For Piaget and education psychologists such as Dewey, Vygotsky, Bruner and Papert, knowledge is constructed by the learner from experiences in interacting with their environment. This led to the term *constructivism* for this type of learning theory (Kennewell, 2004:90; Hurley *et al.*, 1999:128). Individuals create their own meaning of concepts based on what they already know or believe (Richardson, 1997:3). The teacher is seen as a facilitator or co-worker in the learning action. Constructivist-based learning environments are, therefore, characterised by problem-solving activities, the provision of stimulating learning environments, co-operative or co-working learning, promotion of learning through exploration and the use of reliable assessment methods (Roblyer *et al.*, 1997:72). The constructivist approach aims at enabling learners to manage their own learning and develop meta-cognitive skills in the process (Ram, 1996:89). Learners need to learn these processes and both the teacher and ICT can play an important role in stimulating reflective activity and supporting metacognition (Kennewell, 2004:91).

The challenge to utilize ICT in Geography teaching and learning also presents itself within the context of globalisation and polarisation. This challenge occurs in a world experiencing increasing disparities between the rich and poor, among and within nations. For example, while 72.7% of Americans currently use the Internet, only 6.4% of South Africans have access to and use the Internet. These disparities are also reflected in South African schools where more than 73,5% (19 000) of the schools do not have computers, TVs, VCRs, radios, tape recorders or slide- and

film projectors for teaching and learning purposes (Department of Education, 2003:1).

Mansell and When (1998:259) state that limitations in existing infrastructure severely constrain the ICT options for most developing countries. According to Hamelink (1998:2), the growing ICT demand in developing countries necessitates an increase in telephone lines within limited telecommunication grids that will need more than $200 billion in investments to upgrade. Furthermore, according to the Economist (2004:59), Telkom in South Africa has failed to broaden the use of landlines to the poor and rural areas. Local calls are still not free. To add to this, South Africans pay as much as 13 times more for telephone costs than their British counterparts for similar services, and calls are over 60% more expensive than in Finland.

Wireless broadband networks may be an option but have only been utilized in South Africa since June 2005 and at a high cost of approximately R860 per month for basic access and are only available in limited areas (Telkom, 2005; Hutheesing, 2005:118). In addition, Gruman (2005:88) and Huang and Liaw (2005:729) emphasise that many rural and suburban areas will, for some time to come, have no choice for internet access other than dial-up links that are often slow and less reliable than urban lines.

One of the solutions for sufficient ICT support in teaching and learning for developing countries is to focus on ICT variants that are affordable and that will sustain movement toward fulfilling development objectives (Mansell & When, 1998:259). Developing countries (such as the RSA) need to consider alternatives to ICT that maximise the impact of ICT and that entail balancing investment in computers with investment in other technologies that might be cheaper yet equally effective (e.g., video recorders, television sets, etc.). The use of ICT variants must, however, be globally competitive but at the same time cost-effective. The ability, versatility and affordability of an ICT variant such as the Digital Versatile Disc (DVD) suggest that it can serve this purpose (Waters, 2002:1).

With the introduction of the DVD in 1999, Crawford (1999:2) highlighted some advantages of this technology. It is a much more durable audio-visual storage medium than video cassettes, the storing capacity is 4.7 billion bytes of raw data (4.7 GB), seven times the capacity of a CD. In the Republic of South Africa a DVD-player, that can be connected to a television set, already costs below R300, a DVD-ROM under R600 and a writable DVD is approximately R10. A portable DVD player with a lift-up 5.8" screen costs just over a R1000. The DVD has the ability to combine text, audio, photos, animation and videos. Therefore, a DVD offers basic similar advantages to the computer as ICT variant, although certain limitations, such as the lack of interactive programmes, do exist.

The world of today according to Waters (2002:1), requires teaching methods that keep up with the active lives of students, stimulate their intellect in an increasingly distracted society, and accomplish all this within an exemplary instructional design that addresses standards-based education. Waters (2002:1) further states that "Our belief is that DVD-based instruction delivers on all these objectives by employing engaging media, capitalizing on what motivates students and seizing teachable moments". Ryan *et al.* (2000:32-33) emphasise that multimedia learning can provide high quality teaching, but that there are advantages and disadvantages that need to be taken into account. One also has to consider the extent and nature of lecturer support, the extent to which learning materials are prescribed and structured and the ways in which different kinds of media are deployed.

With the acceptance of a constructivist approach, the traditional prescriptive transmission tuition in universities should be replaced by an integrated and interactive approach supported by the available ICT (Prawat, 1992:357). When training teacher students at tertiary institutions, it is important to expose these students to a similar approach to teaching and learning at the tertiary level that is expected from them as teachers in practice (Korthagen & Kessels, 1999:4-5). Concerning the demarcation of this study, the assumption is made that some of the students involved in this DVD training will end up in schools where no ICT equipment is available and, therefore, the utilization of the DVD within their Geography teaching and learning introduces them to ICT.

## 1.2 PROBLEM STATEMENT

The application of ICT as supportive tool in teaching and learning within the radical change that outcomes based education has created pervades the pedagogy and methodology of Geography teaching. It also asks for cost effective, globally competitive ICT variants, which can be utilized in developing countries and necessitates an investigation to identify whether the Digital Versatile Disc (DVD) can effectively support teaching and learning in Geography teaching.

The following research questions need to be addressed:

1. Can the integration of the DVD method support the teaching and learning of Geography teacher students?
2. How does the integration of the DVD alter the format, structure and number of traditional formal Geography lectures?
3. What is the nature of the information on the DVD and how effective is it as perceived by the students?
4. What is the effect of the utilization of the DVD in conjunction with the seminar on the academic performance of Geography teacher students?
5. What will a model for the effective integration and utilization of the DVD in full time Geography teaching and learning look like?

## 1.3 PURPOSE OF THIS STUDY

The purpose of this study is to:

- Determine whether the DVD method can support the teaching and learning of Geography teacher students effectively.
- Determine how the DVD alters the format, structure and number of traditional formal Geography lectures.
- Determine what the nature of the information on the DVD must be in order to be perceived by the students effectively.

- Investigate the effect of the utilization of the DVD on the academic performance of Geography teacher students.
- Develop a model for the effective integration and utilization of the DVD in full time Geography teaching and learning.

## 1.4 METHOD OF RESEARCH

An extensive national and international literature study of primary and secondary sources was conducted to investigate the integration of ICT variants and specifically the DVD in Geography teaching and learning. An action research method was the backbone of this empirical study. The action research included a combined qualitative and quantitative research method in the form of a cross-sectional study as part of a developmental research method (Leedy & Ormrod, 2005:182-183) in order to develop and evaluate a proposed model for the effective integration and utilization of the DVD in Geography teaching and learning. The participants in this study included the entire population of the full time second year students of the Economic Geography module GEOH251 of 2004 (n = 42), 2005 (n = 31) and 2006 (n = 28) of the B.Ed (teaching degree) of the Potchefstroom Campus of the North-West University.

For the quantitative component of the study, two questionnaires were used as well as the official GEOH251 module marks of the students. For the qualitative component various data collection methods were used. The statistical analysis used in this study was done with the assistance of the Statistical Consultation service of the Potchefstroom Campus of the North-West University.

## 1.5 CHAPTER DIVISION

Chapter 2 provides a theoretical framework wherein Geography teaching and learning as well as the integration of information and communication technology (ICT) in Geography teaching and learning can function. The paradigm shift in modern teaching and learning are epitomized by the change that outcomes based education has created, especially in the South African and ultimately in the higher

educational context – which inevitably has implications for the teaching and learning of Geography and the concurrent integration of ICT in Geography.

Chapter 3 focuses on relevant ICT terminology and resources, revealing the so called digital divide between First World and developing countries, highlighting the advantages and potential of the DVD technology for teaching and learning, and finally discussing the consequences of the application and integration of ICT in teaching and learning in general and specifically in Geography teaching and learning. It also summarizes possible guidelines for the integration of ICT in teaching and learning and Geography teaching and learning.

Chapter 4 focuses on the methodology used in this study. Chapter 5 presents the collected data and discusses the findings. Chapter 6 presents and discusses a proposed model for the integration of the DVD in Geography teaching and learning as well as contains the conclusion and recommendations of this study.

# CHAPTER 2

# LEARNING THEORIES, OUTCOMES BASED EDUCATION AND ICT IN GEOGRAPHY TEACHING AND LEARNING

## 2.1 INTRODUCTION

Early in the twentieth century, the still projector of Edison became a popular aid in teaching and learning and he commented in the 'New York Dramatic Mirror' in 1913 that "Books will soon be obsolete in schools. Scholars will soon be instructed through the eye. It is possible to teach every branch of human knowledge with the motion picture. Our school system will be completely changed in ten years." (Chaptal, 1994:58).

Other technologies followed and have been announced decade after decade and implemented in teaching and learning. After film, educational television broadcasts followed as well as audiovisual aids such as filmstrips, slides, overhead transparencies and pre-programmed teaching. In the seventies, video cassettes and computer supported teaching were found. Hereafter, amongst others, video text, interactive video, e-mail, learning robots, CD-Rom and the internet followed, all with new possibilities for teaching and learning (Kennewell, 2004:4, Van der Schee, 2003:206; Wilkinson, 1997:91).

It is, therefore, clear that the effective application of different ICTs in the classroom has offered a wide study area for researchers in the last few decades. It is, therefore, currently not easy to obtain perspectives from the literature which is applicable to the current situation in the Republic of South Africa as a developing country. Researchers in this study field should be continuously aware of the underlying tension between theory and practice, ideal and reality, the advantageous and the disadvantageous, the technological challenge and the human factor (Wilkinson, 1997:91-92).

According to Conacher (1983:39-42) and Houtsonen (2003:47), the decisions concerning the choices and implementation of ICT in teaching and learning rest upon whether the utilization of ICT should be based on scientific learning principles, whether the ICT involved offers an effective medium for teaching and whether it improves learning.

This chapter begins with a brief overview of the tenets of the behaviouristic, constructivist and the social-constructivist approach toward teaching and learning and with ICT. This is followed by a discussion of some theoretical ideas and aspects related to the integration and application of ICT in teaching and learning. Thereafter, a discussion on the change that outcomes based education (OBE) has created and the situation within the South African context. Lastly, there is a discussion on the implication of OBE and learning theories for the teaching and learning of Geography and the training of Geography teachers.

## 2.2 LEARNING THEORIES

When studying learning theories it is important to distinguish between the two important aims thereof. Firstly, they give direction to research, but they are not static. Theories evolve continuously as new research results become known. All scientists strive towards the development of laws that can be applied over a wide spectrum to resolve problems. Secondly, learning theories give direction to the practice of a profession (Wilkinson, 1997:97-98). "A learning theory is like a lens through which we can view situations, such as an educator and learner interacting in a classroom. ...The theory leads us to attend to certain elements of a situation while ignoring others and to see the selected elements in a particular pattern" (Hamilton & Ghatala, 1994:7). Behaviourism and cognitive theories give specific guidance to developers of educational technologies (ICT). They also supply educationists with a dependant basis for evaluating educational material (Thompson *et al.*, 1992:12).

Traditionally, behaviourism was seen as the primary theory that supported educational technology. Cognitive theory, however, has become more important when considering the integration of technology (ICT) in teaching and learning.

Several authors highlight the shifts in some theories regarding the utilization and integration of ICT in teaching and learning (Cooper, 1993:12-19; Spencer, 1988: 2-3; Thompson *et al.*, 1992:10) and will be discussed in the following sections.

### 2.2.1 Behaviouristic approach towards teaching and learning

Of all the theories that are used to support ICT in teaching and learning, behaviourism has had the biggest impact. This theory formed the basis of the development of the first audiovisual material and was also the impetus behind related teaching methods such as learning machines and programmed text. Ideas like Thorndike's connectionism, Pavlov's classic conditioning and Skinner's operant conditioning formed the basis of early research regarding the impact of technology in education on behaviour (Thompson *et al.*, 1992:8-9).

The behaviouristic view focuses on behavioural changes that often require a passive response from learners to different environmental factors. From behaviouristic perspectives, teaching and learning were viewed as being linearly connected. The teaching effort had to produce the required learning product (Gunter *et al.*, 1995:79, 91-93). Learning, therefore, according to Shuell and Moran (1994:3340), occurs as observable changes in the behaviour or actions of the learner in reaction to the transfer of knowledge by the educator, which means that the cognitive processes of learning with this approach have not been taken into account. Knowledge is seen as the objective and an absolute given (Maor & Taylor, 1995:843).

The work of B.F. Skinner, for example, was based on the idea that humans learned from experience through the mechanisms of stimulus-response and operant conditioning. The key elements of the learning process involved the frequency of the activity to be learned and the reinforcement thereof in terms of positive feedback. This implied a very limited role for the educator and learner, involving the repeated presentation of highly structured material to the learner, recognition of correct responses from the learner and dispensing rewards accordingly. The same manner of repeating presentations, as discussed above,

applies once a particular point was mastered (Scheurman, 1998:2-6; Shuell & Moran; 1994:3340; Maor & Taylor, 1995:843).

A gradual reaction to some behaviouristic ideas lead to the neo-behaviouristic idea, namely a recognition that behaviour is all that can be observed, but observed behaviour is dependent of cognitive processes. Bloom's well-known taxonomy of educational goals in the cognitive milieu (1956) was a direct result of Skinner and co-authors' insistence on more effective learning, learning hierarchies and how knowledge is structured (Spencer, 1988:42). These goals were behaviour-oriented and in concurrence with the behaviouristic educational principle and theories of the time. Bloom (1956:12) describes his taxonomy of educational objectives in the cognitive field as a classification of behaviour patterns which propose expected teaching outcomes and is divided into six main categories, namely:

- Knowledge;
- Comprehension;
- Application;
- Analysis;
- Synthesis;
- Evaluation (Bloom, 1956:18).

The taxonomy has a hierarchical order and each goal assumes the attainment of the previous. The focus is, however, on the evidence that a goal is reached instead of the evaluating of actual behaviour (Bloom, 1956:18-19). In his well-known work, the 'Taxonomy of educational objectives', Bloom expresses the hope that educationists can apply the cognitive taxonomy as a useful tool. He mentions various possibilities for administrators, educators and curriculum specialists such as *inter alia* to classify test items, to plan more effective educational programmes, to set goals for new curricula and to classify research (Bloom, 1956:20-24).

As far as learning with ICT is concerned, behaviourism has been particularly influential since the first examples of computer-aided learning (CAL) were based mainly on Skinnerian teaching machines that were developed to apply his theories in a practical format (Kennewell, 2004:90). These teaching machines which

presented material asked the learner an assessment question and presented either new material or remedial material depending on the response. Skinner (1968) argued that machines would perform this role better than educators, as they could represent and replicate the most expert knowledge of content, presentation and sequencing (Skinner, 1968:89; Skinner, 1954:95; Thompson *et al.*, 1992:10; Cooper, 1993:12-19).

Although highly developed empirically and theoretically, this view denies any role of conscious thought or cognition on the part of the learner. The Skinnerian influence in practice can still be seen in tasks where learners practise a skill repetitively and instinctively and in the principles of behaviour modification in order to develop learners' social skills. ICT programmes that present material and then repetitively test knowledge and skills ('drill') are still common in education when developing basic skills of literacy and numeracy (Kennewell, 2004:91).

According to Spetz (1988:57), when the behaviouristic teaching approach was applied in Geography teaching, learners did not like Geography as a subject. Possible reasons for this are that learners are passive receptors of the educator monologue and thereafter they need to memorise places, cities, products and physical characteristics, as well as the representation of knowledge that is expected of learners. Furthermore, newly obtained Geography knowledge or skills in classes, utilized mostly in-class activities such as examinations and tests that had little application value in any situation other than in the classroom (Richardson, 1997:3). According to Rambuda and Frazer (2004:10), research indicated that Geography facts and concepts are taught with minimal comprehension in most Geography classes in South Africa.

Attempts by both national and provincial education departments have been made to improve the quality of Geography teaching and learning in South African schools during the past two years. Higher Education Institutions involved in the training of Geography teachers have aimed to empower teaching students with new teaching strategies in order to enhance the learning process within the OBE milieu (Golightly, 2005:14). Kohn (1982:120) indicated that the learning strategies should include discovery and problem solving learning and that Geography should

be discussed by means of key questions regarding phenomena, processes, patterns and the unknown. These strategies demand that educators facilitate the learning process while the learners construct knowledge based on their research. Learners may communicate their findings, solutions and recommendations by means of various suitable methods such as report writing, graphics and visual presentations.

The use of a behaviourist approach is insufficient as it does not offer adequate countenance of foreknowledge or active and constructive participation of the learners that contribute to the learning process (Golightly, 2005:14). As Cox (1994:59) points out, the direct teaching approach may deny the unavoidable contextualisation to such a degree that the meaning-formation and integration of learning does not take place effectively. If concept, synthesis and eventually the application of knowledge and skills in new situations is the aim (i. e., purposeful learning), then the behaviourist approach has some shortcomings (Spetz, 1988:57; Gunter *et al.*, 1995:80).

By being critical towards the behaviourist teaching approach does not mean that it is no longer granted a place in the education of learners (Airasain & Walsh, 1997:448). Von Glaserfeld (1995:5), a pioneer of constructivism, clearly states that it is a witness of ignorance not to consider learning techniques such as memorisation and rote learning as important. The correct balance between constructive teaching activities and the transferral of information must be found, given that not all aspects of a subject can be learnt in the same manner.

To address these shortcomings other learning theories such as the constructivist and social constructivist learning theories were developed.

### 2.2.2 Constructivist approach towards teaching and learning

The constructivist learning approach developed from the cognitive learning theories. At the same time as behaviourism was influential, Jean Piaget developed his theory of cognitive development. He emphasised the role of experience in

learning. His key theoretical idea was the development of schematic structures in the mind through experience, which constituted understanding (Kennewell, 2004:90). Contrary to the behaviouristic view, a cognitive approach to learning emphasises that meaningful learning is an active, constructive, cumulative, goal oriented and self-regulated process that depends on the learner's thinking actions like perception, contemplation, knowledge exposition and memory. Cognitive learning focuses on meaning presentation and not on behaviouristic change of learners, as is the case with the behaviouristic approach of learning (Shuell, 1986:415; Shuell & Moran, 1994:3341).

For Piaget and education psychologists such as Dewey, Bruner and Papert, knowledge is constructed by the learner from experiences gained in interacting with their environment. This led to the term *constructivism* for this type of learning theory (Kennewell, 2004:90; Hurley *et al.*, 1999:128). Individuals create their own meaning of concepts based on what they already know or believe (Richardson, 1997:3). The educator is seen as a facilitator or co-worker in the learning action. Constructivist-based learning environments are characterised by problem-solving activities, the provision of stimulating learning environments, co-operative or co-working learning, promotion of learning through exploration and the use of reliable assessment methods (Roblyer *et al.*, 1997:72). The constructivist approach, therefore, aims at enabling learners to manage their own learning and develop meta-cognitive skills (see section 2.2.4) in the process (Ram, 1996:89).

Constructivism also suggests that the most important goal for educators is to stimulate conceptual change, which implies a different role for ICT other than the repetitive practise of basic skills. The constructivist role involves providing learners with experiences that may conflict with naive ideas, allowing the educator an opportunity to intervene to help resolve the cognitive conflict through conceptual change. According to Kennewell (2004:90), this can be particularly valuable in science, mathematics and other subjects such as Geography where models and simulations of situations, which are difficult to experience practically, can be implemented with ICT.

The reflection on work progress plays a vital role in the constructivist theories, for without a reflective stage it is unlikely that experiences will have any effect on mental structures (Watkins *et al.*, 2000:39). Learning is precisely that reflective activity which enables the learner to draw on previous experience to understand and evaluate the present, so as to shape future action and formulate new knowledge. Schön (1987:41-44) emphasises the role of reflection-in-action rather than reflection-on-action for improving performance in professional activity that involves the continual planning and monitoring of actions carried out during tasks. This type of metacognitive activity is of importance and for learners, such processes need to be learned. Both the educator and ICT can play an important role in stimulating reflective activity and supporting metacognition. The idea of concept mapping is one way of generating reflection, and the graphic organiser enables ICT to support this activity (Kennewell, 2004:91).

### 2.2.3 Social-constructivist approach towards teaching and learning

The social-constructivist learning approach was also developed from the cognitive learning theories. The constructivist approach focuses primarily on the development of the individual mind. At the same time Piaget was developing his ideas, Vygotsky was pursuing a similar analysis of cognitive development based on social interactions rather than individual experiences as the source of learning (Richardson, 1997:3-7; Prawat, 1993:10). Vygotsky highlighted the need to consider not just interactions between individuals, but the cultural setting in which the interactions take place. Social-constructivism has much more to say directly about teaching as well as learning. The fundamental law of this theory is that knowledge is created in the interaction between people before it becomes internalised by the individual learner. The role of the educator would be expected to be paramount and collaborative activity had an important role to play in learning (Shuell & Moran, 1994:3341-3342).

Through social interaction in cooperative learning environments learners become aware of ideas, retest their own ideas and reinforce or reject their personal reconstructions (Maor & Taylor, 1995:844). For this reason, Fosnot (1996:24)

believes that the cognitive structures of an individual cannot be understood if they are not evaluated within context.

In 1978, Vygotsky proposed a specific feature of the process of learning called the Zone of Proximal Development (ZPD). For a particular learner there will be tasks that he/she can already perform confidently and others that he/she cannot begin to engage in because of the unfamiliarity of the subject matter. The range of the activity in between may be carried out by the learner with support and this is the ZPD. Activity of this sort is the most likely to result in learning. The support may be from a teacher, a fellow learner or from tools and resources (Kennewell, 2004:91). With the rise of the mass communication media, the value of the social-constructivist ideas and the role of ICT in particular are of great relevance. Gage and Berliner (1993:126) state that "In the zone of proximal development, social knowledge – knowledge acquired through social interaction - becomes individual knowledge and individual knowledge grows and becomes more complex".

The idea of teaching being characterised as support within the ZPD can be refined by using the term 'scaffolding' for the assistance given by an educator, tutor, colleague, parent or other more knowledgeable person, which is contingent on the learner's response to a task. Assistance is only provided while the learner is constructing knowledge and should be withheld once the learner can work independently. This process is commonly seen in individual tutoring, but quite rare in busy classrooms where the educator cannot spend enough time with individuals to provide contingent support (Bliss *et al*,. 1996:38). This idea has been the basis of many approaches to using ICT in the classroom, recognising the fact that the learners can make useful judgements about the support they need in a resource-rich (ICT-rich) environment (Kennewell, 2004:92).

To determine whether meaningful learning has taken place within the context of social-constructivism, it is essential that trustworthy and valid assessment methods be implemented in the classroom situation. As far as assessment within the social-constructivism context is concerned, the point of departure is that learners are involved actively in each phase of the investigation process. Otherwise, no meaningful understanding will result or develop from the research

experience that is created in the classroom. Stein *et al.* (1994:17-21) indicate that assessment of the learners within the social-constructivist based learning environment focuses on the process to reach an answer and not only the answer. The facilitator does continuous assessment of the project, portfolios, journals, constructive response, observations and learner-interviews of the learners. Learners can also be involved in the assessment process by either group or self-assessment of assignments and tasks. In the social-constructive theory, summative assessment of learning such as tests and examinations carry less weight and the emphasis falls on the formative assessment of learning.

The social-constructivist approach has not been accepted by all educationists. According to Richardson (1997:7), the criticism of the social-constructivist approach is focused on the importance that is given to the social elements of learning as well as the correlation between educator, learner and formal education. The suggestion of employing constructivist-based strategies in Geography education can generate beneficial learner experiences and results, however, constructivist strategies have been criticized in areas such as prior knowledge, depth versus breadth of coverage, transfer and assessment (Hurley *et al.*, 1999:130). A lack of prior knowledge of subject matter in some constructivist environments could be detrimental to the learner and they, therefore, cannot participate meaningfully in discussions (Molenda, 1991:44).

The challenge for the Geography educator, according to Abdal-Haqq (1998), is not to accept the social-constructivist teaching theory as the only theoretical framework for teaching and learning. It is but one-way which to think about the formation of teaching and learning. The social-constructivist dilemma, as Prawat and Floden (1994:39-40) indicate, is to achieve the right balance between acknowledging the search of meaning of the individual learner and the guidance of the group towards intellectual construction of meaning.

Apart from the traditional and well-known learning theories that were developed to help understand the teaching and learning process, some modern theoretical aspects and viewpoints that are related to the integration and application of ICT in teaching is worthy of some attention.

### 2.2.4 Theoretical aspects related to the integration and application of ICT in teaching and learning

*Metacognition* can be described as 'thinking about your thinking'. It involves both knowing about your cognitive abilities and being able to control them strategically (Flavell, 1976:232). Metacognitive knowledge is important because knowing how well learners are likely to perform in a situation will affect the way they approach a task and how successful they are likely to be. Knowing that they can do something will make the learners feel self-efficacious and will make them more likely to choose to do it and to take the risk of being wrong. Metacognitive skills concern 'when, why and how' learners explore, plan, monitor, regulate and evaluate their progress (Kennewell, 2004:94). Learners can, therefore, learn more effectively and self-regulation needs to become a conscious process (Muijs & Reynolds, 2001:13). These metacognitive skills can be developed by guiding the learners' progress through a task by asking questions that focus their attention at critical points, and requiring them to verbalise or otherwise articulate their thinking as a first step towards internalising the process themselves. In order to stimulate learners' metacognition, teaching approaches should include:

- significant learner autonomy in selection of tools and resources;
- active participation by learners in the process of planning and evaluating the use of tools and resources in problem situations;
- that learners be given opportunities and encouragement to reflect formally on their ICT learning.

(Kennewell *et al.*, 2000:3).

One further theoretical aspect that needs consideration when integrating ICT in teaching and learning is the influence of the *'affective' aspect*. Learning is influenced by the degree in which learners are motivated by the activity they are engaged in and by longer-term aims related to the subject matter and teaching strategy (Cox, 1999:49). Learning does not need to be an unpleasant experience. Papert (1996:4) refers to 'hard fun' as characterising many of the leisure activities such as games engaging with ICT. The self-esteem of learners is also significant because they are more likely to learn if they feel good about themselves in relation

to the setting for activity. There is evidence that these factors are improved for many learners in an ICT environment (Kennewell, 2004:94). This might not be true for all learners and in particular, fewer females than males are motivated merely by the use of ICT and the females also underestimate their abilities with ICT (Kennewell *et al.*, 2000:13). This suggests that, rather than using ICT for its own sake, the purpose and outcome of any task should be considered carefully.

Learners who are not having fun with ICT and learning or who are not emotionally influenced by the use of ICT, find more incentive to use ICT because it can provide the potential and structure for action that they need on a continual basis but cannot get from their educator. They also do not realise that they are investing effort in learning and think that they are practising ICT (Black & Wiliam, 1998:9). If learners can gain success when ICT is used, an immediate positive assessment of Geography as a subject (not just their ICT capability) combined with appropriate praise may give them encouragement to continue their efforts. However, this will only spread to other tasks if they are assisted to reflect on what they have learned.

## 2.3. THE CHANGE THAT OUTCOMES BASED EDUCATION (OBE) HAS CREATED

The introduction of Outcomes Based Education (OBE) teaching and learning all over the world encourages learner-centred teaching and learning and requires a paradigm shift away from the traditional content-based transmission model of teaching and learning (Department of Education, 1997:30). With this new approach, the role of educators has changed dramatically from that of knowledge transferors to facilitators of the learning act (Vermeulen, 1998:17). According to Kapp (1997:6), the OBE approach offers a supportive and stimulating environment with sufficient learning time and additional learning experiences for learners and wherein the learners can work and progress according to their own particular pace. Van der Schee (2003:205-206) even predicted that in future learning institutions will probably be a workstation for ICT supported collaborative learning and a meeting place to discuss the results of their work with peers and educators. Educators will do the briefing, coaching and debriefing. Learners will be involved in a more active and independent way of learning.

The South African government prescribes which outcomes must be acquired in all the teaching and training programmes – also at tertiary level (higher education). Therefore, higher education institutions involved with teacher training in South Africa are obliged by law to present their training programmes within an OBE format. The South African Qualification Authorities (SAQA) prescribed seven critical cross-curricular outcomes and five developmental outcomes (Technical Committee for the Development of an Outcomes Based Curriculum, 1997:10-12).

The critical cross-curricular outcomes require that students identify and solve problems, make decisions using critical and creative thinking, work effectively as members of a team, critically evaluate information, communicate effectively using various modes, use science and technology effectively, act in a responsible manner towards the environment and health of others and demonstrate an understanding of the world as a set of related systems by recognizing that problem solving contexts do not exist in isolation (South African Qualifications Authority, 1998:11).

The developmental outcomes require learners to reflect on and explore a variety of strategies to study more effectively, participate as responsible citizens in the life of local, national and global communities, be culturally and aesthetically sensitive across a range of social contexts, explore education and career opportunities and develop entrepreneurial opportunities (Department of Education, 1997:37). Therefore, it is important that the learning outcomes expressed for teacher training in Geography reflect and address the critical as well as the developmental outcomes, with special emphasis on the different roles of the educator. Realization of these learning outcomes enables the student to identify and solve problems, make decisions based on critical and creative thought processes, function effectively as part of a group, team, organization or community, and gather, analyze, organize and critically evaluate relevant information. Furthermore, students must develop the ability to communicate effectively via spoken language, with visual and/or auditory aids and symbolic language and must be able to use available technology and science effectively to the advantage of their future learners. SAQA also advocates that students be taught different strategies to allow effective and independent learning so that they will become functioning,

responsible adults who participate in the local, national and world community, with emphasis on the development of their entrepreneurial skills (South Africa, 2000:12-13).

In addition, specific outcomes to be acquired are prescribed to institutions involved with teacher training in the form of seven identified teaching roles. The seven roles of the teacher must also be addressed in the learning outcomes set for the Geography student teacher. These roles are: facilitator of learning; interpreter and designer of learning programmes and teaching-learning media; leader, administrator and manager; member of society, public servant and pastor; learner, researcher and life-long learner; assessor and subject specialist (South Africa, 2000:12-13). Even assessment methodology (continuous assessment) is prescribed (National Department of Education, 1998:33-44).

Geography teachers are expected to teach within the social constructivist paradigm, using a learner-centred approach. Fundamental problems may arise when Geography teachers have not received the necessary training to apply OBE in practice. As the application of OBE is relatively new (since 1994) or rarely properly implemented, most potential Geography teachers are familiar with the traditional behaviourist teaching approach (Gold *et al.*, 1991:17). Consequently, their beliefs and perceptions of the nature of teaching and learning do not support the very essence of OBE within the social constructivist paradigm. The way that teachers teach is an artefact of their own schooling, training and experience as teachers (Becker, 1991:8). Moreover, it is necessary for student teachers to be challenged to analyze and question their beliefs and perceptions regarding teaching and learning, i.e., by testing their perceptions against modern theories and teaching practices (Golightly *et al.*, 2006:186). Instructional change, therefore, can only proceed with a corresponding change in beliefs about instruction and learning (Dwyer *et al.*, 1991:52).

When training student teachers at higher education institutions, it is important that they be exposed to the types of teaching and learning paradigms that they themselves will have to implement in school practice (Korthagen & Kessels 1999:4-5). The role of the university is changing and, therefore, altering higher

education's core production and delivery process (Ryan *et al.*, 2000:22). Lecturers must, therefore, continuously strive to create learning environments and experiences that will enable students to construct their own knowledge, rather than embrace the traditional teaching method of knowledge transferral (Barr & Tagg, 1995:15). Students will demand flexible, targeted, accessible learning methods (Ryan *et al.*, 2000:22). Regarding Geography teaching and learning, it is the responsibility of the lecturer to create a learning environment that will challenge the student to develop a deeper approach to learning (Prosser & Trigwell, 1999:10-12). It is essential that students be more responsible for their own learning (Mills & Cottell, 1998:26) and that they realize the set learning outcomes within corporative and resource-based learning environments. It is, therefore, important that students be given the opportunity to reflect on outcomes realization that will enable the lecturer to determine whether meaningful learning has transpired (McCombs & Whisler, 1997:55).

Together with the shift to a learner-centred teaching approach in higher education, it inevitably means that universities have to reduce the contact time between students and lecturers (Zollo, 1999:17). According to Gibbs (1992:38) and Agnew (2001:294), this is also due to the increase in student numbers, a decrease in funding by national authorities and more effective time management by lecturers requiring them to spend more time on activities to generate funds for universities such as research. Together with optimizing contact time between lecturer and student, Zollo (1999: 18) explains that greater emphasis is placed on "the use of different forms of delivery, including modularized courses, independent learning packages, computer assisted learning and flexible or external delivery, making students more self-directed".

### 2.3.1 The implications of the paradigm shift for the integration of ICT within Geography teaching and learning

While studies of the integration of particular ICT in traditional classrooms within existing educational structures continue, there are also calls for exploring new means of teaching and learning based on an integration of ICT in education (Jackson, 2000:162). Considering the possibilities that ICT provides, there is an

inherent shift in the meaning of teaching and learning when these ICTs are used as the basis of the integration of ICT in different educational programmes. ICT enables learners to have access to a greater variety of materials and influences learners' thinking rather than solely depending on the materials and arguments presented by their educators (Jackson, 2000:162).

These changes in the technological developments, according to Lewis (1999:142), are causing a shift that can be referred to as a move from traditional teaching to constructive learning. Traditional teaching seeks to transmit fixed, well-structured knowledge with a firm external control of content, sequence and pace of learning. Constructive learning stresses active, outcome oriented and self-regulated learning, where meaning is negotiated, multiple perspectives are encouraged and learners map their way through ever-changing information and knowledge.

Constructive learning has become the core of recent educational philosophy, and the teaching styles need to match the learning. According to Lewis (1999:143), educators can no longer view ICT as a separate entity that can be incorporated in the classroom to teach content to learners. They need to look at ICT in conjunction with teaching and learning to develop a fulfilling and useful curriculum. By using ICT in a constructive way, the educator not only increases the amount of content being taught, he or she also equips learners with a wide range of sophisticated skills that are enhanced by the ICT. According to McConnell (1999:177), it is also important to understand how technology can facilitate learning and the development of skills, particularly through learner-centred and collaborative approaches. Chambers (1999:151) supports this argument in his research on the integration of the CD-ROM in Geography teaching and learning and states that new technologies not only assist learners in finding specific information, but also enhance a range of skills associated with deep level processing and meaningful learning such as metacognition, problem solving and critical thinking.

This change from traditional/conventional teaching to constructive/networked learning is a paradigm shift in teaching and learning in education and, therefore, technology needs to be thought of much more radically as the means by which schools, colleges and universities will respond to the challenges they currently

face (Lewis, 1999:149). Chambers (1999:151) raises the following questions: "Are the world wide web and multimedia technologies only to feed a reproducing model of learning? Or have they the potential to facilitate a transforming model of learning?" Answers to some of these fundamental questions are not completely new, as Papert, back in 1980 discussed how learning to communicate with a computer may change the way other learning takes place. However, technology progressed so rapidly that the potential opportunities for innovative ways of teaching and learning, coupled with the evolution in the ways in which learners are obtaining and processing information, have increased the pressures on moving away from traditional methods of teaching to more constructive learning (Jackson, 2000:164).

According to Van der Schee (2003:210), the integration of ICT in teaching and learning necessitates a major change in Geography teaching and learning. In traditional Geography lessons, the educator explains the world to the learners. Modern Geography lessons challenge learners to explore the world themselves. Authors believe that ICT will accelerate a shift in teaching and learning from behaviourist to constructivist approaches (Hill & Solem, 1999:100-107; Sharpe, 2000:261-262). Gillespie (1998:39) refers to this shift as a change from traditional approaches towards a new paradigm in Geography teaching (see Table 2.1).

**Table 2.1 The shift from traditional learning to a new paradigm in Geography teaching**

| Traditional approaches to instruction | The new paradigm |
|---|---|
| Teacher directed | Learner-centred |
| Didactic teaching | Student exploration |
| Short blocks of instruction on a single subject | Extended blocks of multidisciplinary instruction |
| Passive or one-way modes of instruction | Active and interactive modes of instruction |
| Individual, competitive work | Collaborative, cooperative work |
| Educator as a knowledge dispenser | Educator as a facilitator or guide |
| Ability grouping | Heterogeneous grouping |
| Assessment of knowledge, specific skills | Performance-based assessment |

Gillespie (1998:40)

The interactive, user-centred and open structure of new technologies (ICT), particularly the internet and mass storage devices, are ideal for the creation of constructivist learning environments (Sharpe, 2000:263). Although there are

different traditions within constructivism, they share the view that knowledge is not transmitted directly from one knower to another, but is actively built up by the learner (Driver *et al.*, 1994:5).

Modern ICT is not just another tool for Geography teaching. It has the potential to be much more than that. ICT can move the teaching and learning of Geography in new directions. It is not necessary to revise the curricula to incorporate ICT as the danger exists that Geography may be pushed into the background if too much focus is placed on the use of the ICT. Learners can carry out particular techniques, even if they do not have the ability to ask the right research questions, or know how to go about answering questions they may have formulated. Procedural and instrumental knowledge (as obtained from ICTs) should be seen as important and necessary additions to, and not a replacement for, geographical declarative knowledge (Van der Schee, 2003:210).

With the acceptance of a constructivist approach, the traditional prescriptive transmission tuition in universities should be replaced by an integrated and interactive approach supported by the available ICT (Prawat, 1992:357). When training teacher students at tertiary institutions, it is important to expose these learners to a similar approach to teaching and learning at a tertiary level as will be expected of them as teachers in practice (Korthagen & Kessels, 1999:4-5).

The Geography teaching lecturer cannot merely accept that as long as learners are active, effective or meaningful learning will take place. The onus rests on the Geography teaching lecturer to create learning experiences and environments and to challenge learners towards in-depth learning (Prosser & Trigwell, 1999:24). Warburton (2003:44) emphasises that the most important in-depth learning strategies are skills, cross-reference, imaginative reconstructions and independent thought. For this reason, learning activities and experiences should be chosen, planned and constructed in such a way as to have educational value whereby the learners can concurrently make sense of their life experience and their subject knowledge will grow and contribute towards in-depth learning (Prawat, 1992:370).

Traditional lecture methods in Geography according to Agnew and Elton (1998:13) and Van der Schee (2003:210-211), must be replaced with interactive lectures, resource based learning, independent learning, practical and project work, etc. Within this interactive learning environment the learners are able to construct their own knowledge, and meaning is given to learning. It is of importance that the opportunities be created for the Geography teaching student to reflect and use new knowledge and skills in new situations. It is the responsibility of the lecturer to provide feedback to the learners once the task has been completed with the focus on the evidence of the process and outcomes in terms of the product. With the report back of the process, the aim is to influence the learner during his/her self-evaluation period so that in-depth learning methods will be part of his/her pre-thoughts when approaching tasks (Gorden & Debus, 2002:484). The emphasis on in-depth and active learning contributes to the Geography teaching student's ability to apply the knowledge gained in other situations other than using it in tests and examinations.

The implementation of the new paradigm approach in teacher training as discussed this far, will lead to an extensively revised Geography curriculum and time schedule for Geography teaching training (Gillespie, 1998:39-40; Golightly, 2005:19). When students are active and involved in problem solving activities, the contact periods of fifty minutes are not always suitable (Windschitl, 1999:751-756). The Geography teaching lecturer will have to negotiate with the administrators and programme managers for the possibility of block scheduling and integrating the curricula in other lecturing areas (i.e., instead of the three fifty minute contact sessions per week, it can be suggested that there be one contact session of two and a half hours) (Golightly, 2005:20). According to Gold *et al.* (1991:65) and Tansley and Bryson (2000:335-336), seminars are traditionally as much a part of teaching as lectures in Geographical higher education. Seminars are used for a variety of purposes, ranging from examination revision to synoptic overview, but most seminars work on the assumption that learners arrive to discuss work prepared in advance of the class. These preparations can be some reading or an essay, group work activity or assignments that students have to prepare. The educator's task is then to structure and lead discussions, with the objective being to achieve an intellectual exchange and deepened understanding. Seminars

should be constituted in such a way that the procedure therein is properly planned and scheduled and that the educator takes responsibility for the proceedings order and the successful execution thereof (Gold *et al.*, 1991:66-67).

When the seminar is used together with ICT, Hurley *et al.* (1999:132) state that the seminar intentionally employs numerous constructivist-based teaching and learning strategies such as collaborative teams, role-playing, accessing primary data sources, learner-centred curriculum, educators as facilitators, qualitative assessment and experiential use of technology.

## 2.4 CONCLUSION

As Geography educators continue to expand their curriculum to incorporate information and communication technology (ICT), it is appropriate to consider which learning theories may best support the use of ICT variants for teaching and learning. The aim of this chapter was to discuss the different learning theories which are applicable to the integration of ICT in teaching and learning as well as for the teaching and learning of Geography.

Geography educators and learners must seriously consider the implications of outcomes based education (OBE) as a new teaching and learning approach. It is the direct result of the paradigm shift in perspectives of teaching and learning and has been well received across the world. Various learning theories, such as the behaviourist and cognitive learning theories have been developed in an attempt to better understand certain aspects of the learning situation. It is, therefore, important to understand some of the key theoretical ideas, concerning teaching and learning as well as to understand what happens during the use, application and integration of the ICT. The discussion highlights the development of behaviourism to cognitive-orientated behaviourism, wherein Bloom's taxonomy of educational objectives are embedded, to constructivism and ultimately to social-constructivism.

The aim of this chapter was also to highlight the implications of the social constructivist approach for the training of Geography teaching students as well as

for the integration of ICT. The social constructivist approach focuses on the individual meaning-making process for students within a social environment or milieu supported by various ICTs. The Geography education lecturer is, therefore, a context or opportunity creator for interactive learning that will guide the students to construe knowledge for him or herself. This can easily be created by the integration of suitable ICTs to promote learner-centred learning. The challenge is for the Geography education lecturer to implement specific teaching techniques in the class situation, for example, lecturing, discussions, co-operative learning, learner-centred learning and investigative learning using the social constructivist teaching principles. The question for the lecturer is not which teaching technique to use or which ICT to utilize, but rather how to use this technique and ICT to encourage learner-centred learning and how it can lead to the acquisition of meaningful subject content.

Optimally, traditional lecture methods in Geography must be replaced with interactive lectures, resource based learning, independent learning, practical and project work, etc. Within this interactive learning environment the learners should be able to construct their own knowledge and as a result meaning is given to learning. It is important that opportunities should be created for the Geography teaching student to reflect and use new knowledge and skills in new situations. The emphasis on in-depth and active learning contributes to the Geography teaching student's ability to apply the knowledge gained in other situations other than using it in tests and examinations. The implementation of the new paradigm approach, according to Gillespie (1998), in teacher training, as discussed in this chapter, must lead to an extensively revised Geography curriculum and time schedule for Geography teacher training.

# CHAPTER 3

# THE INTEGRATION OF ICT INTO GEOGRAPHY TEACHING AND LEARNING

## 3.1 INTRODUCTION

The integration of Information and Communication Technology (ICT) in teaching and learning, as required by the South African Department of Education, pervades and consequently alters the pedagogy and methodology of teaching and learning (Department of Education, 2003:13; Bishop & Shroder, 1995:1; Freeman, 1997:202). ICT is important in education because it is an essential part of the modern world and many aspects of our lives now depend upon it. According to Kennewell (2004:14), there is also much evidence that well thought out applications of ICT in teaching and learning can bring about a variety of benefits for learners (see par. 3.5.1).

This chapter will, firstly, clarify some relevant ICT terminology, concepts and resources and secondly, highlight the digital divide between first and third world countries which inevitably draws the attention to the DVD as an ICT resource for teaching and learning. Finally, it is necessary to discuss the integration of ICT into education in general and more specifically into Geography teaching and learning.

## 3.2 ICT TERMINOLOGY AND RESOURCES

Information and Communication Technology (ICT) is a combination of three different terminologies and can be used in different combinations. Technology can be incorporated in education in various ways, therefore, general discussions about technology and education can be confusing if the context in which the word 'technology' is used is not clearly defined (Jackson, 2000:154). According to Lewis (1999:148), the word 'technology' in an educational context can be:

- a curriculum area in itself such as IT (information technology) skills for learners, word processing, using e-mail, etc.;
- the presentation of learning material for learners, with occasional additional functions such as assessment;
- the administrative and managerial infrastructure (finance, personnel, etc.); and as
- a learning system through which teaching and learning are managed, transacted and recorded regardless of the location of the learner.

With the integration of ICT in Geography teaching and learning, the focus is on the second and fourth definitions, namely, a way in which information is presented to learners and the use of technology as a learner-centred, resource-based tool (Kent, 2000:154).

There is also a contextual difference between the use of the terms information technology (IT), communication technology (CT) and information and communication technology (ICT).

- 'IT' refers to the learners' knowledge and understanding of the technology and their ability to apply it (King, 2000:3). It is also a term used to describe the items of equipment (hardware) and computer programmes (software) that allow one to access, retrieve, store, organise, manipulate and present information by electronic means;
- 'CT' is a term used to describe telecommunications equipment through which information can be sought, sent and accessed, for example, phones, faxes, modems and computers (Department of Education, 2003:8), whereas,
- 'ICT' refers to the computing and communications that support teaching and learning, where the focus is on the curriculum subject being taught and not on the technology skills. ICT is not just about computers, it also covers the use of fax machines, tape recorders, cameras, etc. (King, 2000:3; Loveless, 2003:ix). ICT is, therefore, a combination of networks, hardware and software as well as the means of communication, collaboration and

engagement that enables the processing, management and exchange of data, as well as information and knowledge (Department of Education, 2003:8).

'ICT' has a distinctive contribution to make in the communication of information for the teaching and learning process, whether it be text, visual images or sound (Loveless, 2003:77).

Other definitions related to ICT are described by the Department of Education (2003:8-9) and Ryan *et al.* (2000:32-33) as follows:

- 'Digital literacy' refers to the ability to appreciate the potential of ICT to support innovation learning and creative processes. Learners need to have the confidence, skills and discrimination to adopt ICT in appropriate ways. Digital literacy is seen as a "life skill" in the same category as literacy and numeracy;
- 'Information literacy' is the ability to locate, evaluate, manipulate, manage and communicate information from different sources. As learners become increasingly information-literate, they develop skills in discrimination, interpretation and critical analysis. ICT offer opportunities for higher-order thinking and creativity in processing, constructing and conveying knowledge;
- 'e-learning' is flexible learning using ICT resources, tools and applications, focusing on the interaction among educators, learners, the online environment and on collaborative learning. E-learning usually refers to structured and managed learning experiences and may involve the use of the internet, CD-ROM, software, other media and telecommunications.

ICT resources can, according to Kennewell (2004:5) and the Department of Education (2003:8), be broadly classified as:

- hardware – the equipment, such as a personal computer (PC), CD-ROM, DVD player, scanner, digital camera and interactive whiteboard;
- software – the stored instructions which enable the hardware to operate automatically, together with the information that it stores and processes,

such as a word processing programme and the documents produced using it;

- media – the materials that carry data and programmes, such as CD, DVD or hard disks; and
- services – combinations of hardware, software and human resources that enable users to achieve more than they could with hardware and software alone, such as the internet and mass storage interactive devices.

The term ICT, therefore, covers all aspects of computers, networks (including the internet) and certain other devices with information storage and processing capacity such as calculators, mobile phones and automatic control devices (Kennewell, 2004:4). The common factors here are that the devices process, store or communicate information and that they are digital (i. e., they handle information by representing it in terms of discrete symbols). This gives them massive information handling power in relation to their size and energy consumed compared to older analogue technologies such as radio and TV, audio and video recording and traditional telephones (Kennewell, 2004:4; Van der Schee, 2003:206; Freeman, 1997:203-204). According to Van der Schee (2003:208), the emphasis is not on how the technologies work, but what they can do to promote or support teaching and learning effectively.

ICT resources (hardware, software, media and services) that can be integrated into teaching and learning effectively are the following:

- CAD (computer-aided design),
- the calculator,
- CD-ROM,
- DVD-technology,
- data logging,
- database/GIS (Geographical Information Systems),
- desktop PC,
- digital camera,
- digital video,

- DTP (desktop publishing),
- e-commerce,
- e-mail,
- digital encyclopaedia,
- graphic organizer,
- internet,
- intranet,
- laptop PC,
- mobile phone,
- PDA (personal data assistant),
- playstations,
- SMS (text messaging),
- spreadsheets,
- video games,
- VLE (virtual learning environment),
- WWW (world wide web) and
- GPS (Global positioning system)

(Kennewell, 2004:6; Van der Schee, 2003:206-207; Waters, 2002:1).

### 3.3 THE DIGITAL DIVIDE -The ICT situation in developing countries

The challenge to utilize ICT in Geography teaching and learning effectively also presents itself within the context of globalisation and polarisation. This challenge occurs in a world experiencing increasing disparities between the rich and poor, among and within nations (Department of Education, 2003:1). The quest for the utilization of ICT in teaching and learning continues to pose a challenge for education around the world (Bowles, 2006:3, Department of Education, 2003:13, Bishop & Shroder, 1995:1).

The Internet and the World Wide Web, are currently the most commonly used ICT variants and are used progressively more as a resource and communication tool in teaching and learning throughout the world (Lundall & Howell, 2000:67; Stanfield, 2003:2). The internet's pace of adoption for example, eclipses all technologies

before it. Radio existed 38 years before it gained 50 million listeners, while television took 13 years to reach that point. The internet, however, crossed that line in four years: in 1994 three million people were connected and by March 1998 the figure was 119 million. Traffic on the internet doubles every 100 days (Lynch, 1998, quoted in Kent, 2000:156). Unfortunately, the developing world does not share in this latest, fast growing prosperity (Mansell & When, 1998:259).

While 72.7% of Americans currently use the internet, only 6.4% of South Africans have access to and use the internet. These disparities are also reflected in South African schools where more than 73,5% (19 000) of the schools do not have any computers, TVs, VCRs, radios, tape recorders or slide and film projectors for teaching and learning purposes (Department of Education, 2003:1).

Mansell and When (1998:259) state that limitations in existing infrastructure severely constrain the ICT options for most developing countries. According to Hamelink (1998:2), the growing ICT demand in developing countries necessitates an increase in telephone lines within very limited telecommunication grids that will need over $200 billion in investments to upgrade. Furthermore, Telkom in South Africa has failed to broaden the use of landlines to the poor and rural areas. Local calls are still not free and in addition, South Africans pay as much as 13 times more for telephone costs than their British counterparts for similar services and calls are over 60% more expensive than in Finland (Economist, 2004:59).

Wireless broadband networks may be an option but have only been utilized in South Africa since June 2005 and at a high cost of approximately R860 per month for basic access and are only available in limited areas (Telkom, 2005, Hutheesing, 2005:118). In addition, Gruman (2005:88) and Huang and Liaw (2005:729) emphasise that many rural and suburban areas will, for some time to come, have no choice for internet access other than dial-up links that are often slow and less reliable than urban lines.

Beyond the issue of access, there is a gap in the ability of learners and educators to use ICT effectively, to access high quality and diverse content, to create content

of their own, and to communicate, collaborate and integrate ICT into teaching and learning (Department of Education, 2003:6).

These limitations, as discussed above, should not prevent the educator or trainee educator from planning to integrate ICT, and considering alternative applications of ICT, for example gathering of material on disk (CD or DVD) from external sources (Bowles, 2006:4). According to De Moura (1999:39-43), there are ICT variants that can be utilized as alternatives to computers, the internet and the World Wide Web, like the Telecurso 2000 of Brazil and the Telecundaria model of Mexico where these developing countries turn to television broadcasting instead as a means of improving access to education, in combination with community learning-centres or tele-centres. It seems that multi-pronged strategies that allow developing countries to experiment with different settings may well allow countries to develop their own models of best practice.

One of the solutions for sufficient ICT support in teaching and learning for developing countries is to focus on ICT variants that are affordable and that will sustain movement toward fulfilling development objectives (Mansell & When, 1998:259). Developing countries (like the RSA), according to Lewis (1999:149), need to consider alternatives to ICT that maximise the impact of ICT and that entail balancing investment in computers with investment in other technologies that might be cheaper and equally effective (e.g., video recorders, television sets, etc.). The use of ICT variants must, however, be globally competitive and at the same time be cost-effective. The ability, versatility and low cost of an ICT variant such as the Digital Versatile Disc (DVD) suggest that it can serve this purpose (Waters, 2002:1).

## 3.4 THE DVD TECHNOLOGY

The effective integration of the DVD into teaching and learning may prove to be a cost effective and technological answer for developing countries. A non-profit research organization and a DVD/CD-ROM production and marketing services company that are working together to promote the use of the DVD format for educational and training applications, claim that DVD technology is the future of

teaching. The DVD offers unmatched storage capacity, portability, a much higher image quality and flexibility compared to the traditional video tape and CD-ROM (Waters, 2002:1).

With the introduction of the DVD in 1999, Crawford (1999:71-74) highlighted a few advantages of this technology:

- It is a more durable audio-visual storage medium than video cassettes.
- There is no physical contact between the playing head and the disc and as with a CD, the data surface is protected by chemically inactive plastic.
- The storing capacity is 4.7 billion bytes of raw data (4.7 GB), seven times the capacity of a CD. A two-sided DVD can carry twice as much data (up to 9.4 GB).
- DVD offers much higher-quality video playback than VHS video.
- There is at least twice as much picture information in a well mastered DVD than in VHS.
- Additionally, each side of a DVD can have two information layers, one of them semi-transparent that enables a one-sided dual-layer DVD (the most common) to have more than 8.5 GB that equals 28 CD's.
- DVD player prices in South Africa already cost less than R300 (±US$50) and less than R600 (±US$100) for a DVD-ROM, a writable DVD is approximately R10 (±US$1.6).
- A portable DVD player with a lift-up 5.8" screen costs just over a R1000 (±US$164).
- The DVD has the ability to combine text, audio, photographs, animation and videos.
- DVDs offer basically the same as computers (although certain limitations exist) which the video cannot offer.

The world of today, according to Waters (2002:1), requires teaching methods (that ultimately include the integration of ICT) that keep up with the active lives of learners, stimulate their intellect in an increasingly distracted society, and

accomplish all this within an exemplary teaching and learning design that addresses standards-based education. "Our belief is that DVD-based instruction delivers on all these objectives by employing engaging media, capitalizing on what motivates learners and seizing teachable moments." (Waters, 2002:1.) Ryan *et al.* (2000:32-33) emphasise that multimedia learning, that are combined on a DVD, can provide high quality teaching. One also has to take into consideration, when integrating the DVD into teaching and learning, the extent and kind of lecturer support, the extent to which learning materials are prescribed and structured and the ways in which different kinds of media are deployed.

## 3.5 THE INTEGRATION OF ICT IN TEACHING AND LEARNING

The literature regarding the integration of the DVD as ICT-variant in teaching and learning is limited, but the DVD is a modern variant of ICT (see par. 3.2 and 3.6.1) that means discussions regarding the integration of ICT in teaching and learning will evidently apply to the DVD.

The role of the educator within a modern ICT educational environment is changing. The educator within the OBE context is no longer the main source of knowledge in the classroom (Cornu, 2003:3). Regarding the learner, OBE encourages learner-centred teaching and learning, which is viable in an ICT learning environment (Department of Education, 1997:30). According to Kapp (1997:6) and Húsen and Postlethwaite (1994:3297), the OBE approach should offer a supportive and stimulating environment by means of various ICTs, with sufficient learning time and additional learning experiences for learners wherein learners can work and progress according to their own particular pace.

### 3.5.1 ICT and the Learner

With ICT it is possible for learners to learn at different times, different places and without direct supervision by an educator. ICT can facilitate autonomous learning for learners and it is expected that by allowing learners greater autonomy in their

work it will help them to develop learning skills that will serve them well beyond their formal education (Somekh & Davies, 1991:153).

Research suggests that the use of ICT stimulates student learning. When ICT is used with interactive multimedia methods of instruction, retention is raised much more than in the case of a lecture approach with visual aids or a discussion (Van der Schee, 2003:209). Research carried out by Kennewell and Beauchamp (2003:71-72), Hurley *et al.* (1999:129) supported by Jackson (2000:165), Leask (1999:41) and Van der Schee (2003:209) provides good reasons for using ICT in learning. These reasons include:

- ICT helps learners to access a wide range of up-to-date information sources from within and beyond the classroom;
- ICT gives learners immediate access to richer source materials;
- ICT helps learners to process information and develop high quality reports; produce dynamic images to represent relationships;
- ICT can present information in new ways that help learners to understand, assimilate and use it more readily;
- ICT helps learners to hypothesise and test ideas for themselves;
- ICT helps to engage in activities similar to those carried out by professionals and academics in the subject;
- ICT removes the chore of processing data manually and frees learners to concentrate on interpretation and use;
- ICT helps learners to work together in teams;
- ICT has the flexibility to meet the individual needs and abilities of each student;
- ICT motivates and stimulates learning; and
- ICT helps learners to work independently of their educator.

There are two ways in which ICT can be integrated in the learning process. ICT may be placed in control of the learner's activities in the learning process in the

form of direct teaching packages or, as named by Mayer (2001:8), 'Technology-centred learning approach'. These ICTs (direct teaching packages for example) which can be put in control of the learner's learning activities, can be used by learners independently of the educator to develop knowledge, understanding or skills. Programmes may include demonstrations of skills, explanations of ideas (with text, sound, diagrams, animations or video), questioning of the learner, checking of response, feedback on the quality of the response, remediation material if needed, progression on the next topic, thereby putting the ICT in control of the learner's learning activities (Underwood & Brown, 1997:26-41). Putting the ICT in control of the learner's activities is attractive in many situations in the classroom as it is able to give more immediate feedback than the educator, allows the learner to work independently of the educator who can then devote more time to working on more difficult subject matters (Kennewell, 2004:51).

On the other hand, learners can also be put in control of ICTs in order to enhance their learning and according to Mayer (2001:10), it is a 'Learner-centered learning approach'. These ICTs which the learners control include any form of virtual learning environments, are effective for teaching and learning because they provide tools for educators and learners to help manage learning (Kennewell, 2004:50-51). The involved ICT assists educators to structure the curriculum over a period of time, to communicate objectives, to provide multimedia resources and to access the materials. This ICT also helps with setting and scheduling tasks and supporting learners in working together (Becta, 2003).

### 3.5.2 ICT and the educator

With the integration of ICT into teaching and learning, especially with learner-centred learning, the educator must still remain at the heart of the learning activity. Learners need a combination of stimulation, structure, guidance and feedback. The educator's role as a manager of learning – setting of targets, advising on pathways and validating knowledge – is now more important than in traditional teaching and learning (Somekh & Davis, 1991:13; Kennewell, 2004:85). The difference now is that the educator must know how to use ICT in teaching and how to help learners use ICT in learning (Kennewell, 2004:17).

ICT also helps the educator to:

- access a wide range of up-to-date information resources from within and beyond the classroom;
- prepare high quality material for learners to see as a class and to interact with individually;
- organise a variety of resources in advance of a lesson that can be accessed easily and rapidly for class use;
- focus learners' attention on key concepts;
- monitor learners' progress on tasks;
- analyze learners' attainment and set targets for learning; and
- collaborate with colleagues in other institutions and at times of their choice.

(Kennewell & Beauchamp, 2003:13; Hurley *et al.*, 1999:129, Van der Schee, 2003:210; Jackson, 2000:165).

### 3.5.3 Teaching and learning with ICT resources

ICT can transform the way knowledge is packaged, delivered, accessed, acquired and measured, altering education's core production and delivery process. Learners will demand flexible, targeted, accessible learning methods, potentially altering education's traditional role (Coopers & Lybrand, 2005).

According to Ryan *et al.* (2000:22), learning with the support of ICT can best be described as 'resource-based learning' (RBL). The emphasis is placed on the process of learning through ICT in combination with different instructional formats, rather than one instructional format as in traditional teaching. Ryan *et al.* (2000:4 and 30) states that resourced-based learning can also be: 'individualized learning', 'ICT-aided learning', 'learner-centred learning', 'self organized learning' and 'independent study'. The National Council for Open and Distance Education (NCODE, 2005) of Australia describes resource-based learning as a strategy to

promote learner-centred learning in an educational context through a combination of specially designed learning resources and ICT.

Learning with the support of ICT will automatically be learning with multimedia because it will always be the presentation of material using both words and pictures as well as two or more delivery devices (Mayer, 2001:2, 5). Words in this case can be in verbal form such as printed or spoken text and pictures refer to the material presented in pictorial form such as using static graphics, including illustrations, graphs, photos, maps, or using dynamic graphics, including animation and video (Mayer, 2001:2; Mayer & Moreno, 2003:43). Multimedia also includes hypermedia, which emphasises interactivity and specifically means the ability to link one form of content to another selectively (Van der Schee, 2003:206). Multimedia, as a combination of ICT resources can, therefore, be viewed in three ways based on the devices used to deliver an instructional message, the representational formats used to present the instructional message and the sense modalities the learner uses to receive the instructional message (Mayer, 2001:5).

## 3.6 THE INTEGRATION OF ICT IN GEOGRAPHY TEACHING AND LEARNING

Geography is a subject in which ICT can make a definite and worthwhile contribution and it is, therefore, important that Geography educators know how to harness the benefits of ICT for their learners (Freeman, 1997:202). Continuously, ICT will mean new frontiers for teaching with more and more people in and outside Geography working with search engines, instant messaging, e-mail, interactive computer simulation programmes, remote sensing images, GPS and GIS. This is not the whole range of ICTs but it gives an idea of some important ICTs, which are also available for Geography teaching and learning (Van der Schee, 2003:207).

Nellis (1994:36) indicates that through ICT variants such as computer graphics, Geography computer software and simulations as well as Geographic Information Systems (GIS), Global Positioning Systems (GPS) and remote sensing, Geography educators and learners can address a broader range of spatial questions than was previously possible. Geography has always been known as a

subject that utilises high profile technologies and will continue to do so (Kent, 1992:164).

### 3.6.1 Historical overview of ICT integration in Geography teaching and learning

'Since all information is conveyed through a medium, we need media to acquire knowledge and skills. Geographical education has long been known for its use of a wide range of different information carriers including voice, blackboard, book, model, poster, whiteboard, overhead transparency sheet, slide, film, video and computer disk. This list is ordered chronologically from 'old' to 'new' media. In the modern era, only the use of the computer and similar technologies are regarded as new, and even then it depends on the type of hardware and software whether it is really new or not (Van der Schee, 2003:206). Modern or new ICTs for Geography education encompass, for example, 3-D and virtual reality environments; one-to-one and one-to-many visual communication; telephone and digital integration; highly interactive user interfaces; special audiovisual effects; live internet broadcasting; CD and DVD media; etc. (http://searchwebmanagement.techtarget.com. 2004).

According to Kent (1992:164), Geography has been a front runner as early as the sixties, in grasping the pedagogic potential of new technology. In the 1970's, ICT in the Geography classroom was, however, limited to a minority of Geography teachers who were touched by computing. By the 1980's, the emphasis on the use of computers in the Geography classrooms grew (Jackson, 2000:2). Evidence of this is that as early as 1983, the *Teaching Geography* magazine established an 'ICT Page' with articles and reviews of software, and there has been a steady flow of books aimed at supporting and encouraging the use of ICT in Geography since the early 1980's. In this same time period, according to Twells (1996:15), case studies of 'how microcomputers could be used in Geography lessons as well as 'subject specific, pre-written programmes of software, supplying a limited amount of knowledge and often involving mechanistic forms of learning' were characteristic, and the 'emphasis in Geography began to move away from using the computer as a calculative tool towards simulation'.

The nineties was a time period in which the internet and all its related resources had a significant impact on society and education internationally (Durbin & Sanders, 1996:15). Internet connections provided access to a variety of ICT resources such as websites with international data, e-mail and chatroom facilities and live web cameras showing everything from volcanic eruptions to game park watering holes in Africa. These ICT resources enable educators and learners to obtain a diverse amount of information that can be incorporated into teaching and learning and can be valuable for subjects such as Geography (Kent, 2000:157).

Currently, the incorporation of ICT into education in general and Geography education in particular, is an increasingly important issue and the perception of how ICT should be incorporated into education is changing drastically. The focus is no longer solely on incorporating ICT into existing education, but is looking at teaching and learning first and devising valuable ways of using ICT to enhance this process. However, the very nature of teaching and learning is being questioned with the rapid rate in which ICT is being developed and used more universally, along with the evolving needs of learners, governments and educators (Jackson, 2000:6; Kennewell, 2004:14).

### 3.6.2 ICT and the learner in Geography

The processing of data and analysis of relationships concerning human activity and the natural environment has been transformed by ICT. According to Bransford *et al.* (1999:195); Van der Schee (2003:212); Bowles (2006:2) and Kennewell (2004:69-71), the integration of ICT into Geography teaching and learning can bring about a number of benefits for learners if they are entitled to use ICT to:

- Enhance their skills of geographical enquiry;
- Gain access to a wide range of geographical knowledge and information sources;
- Acquire more opportunities for feedback, reflection and revision;
- Deepen their understanding of environmental and spatial relationships;

- Experience alternative images of people, place and environment;
- Consider the wider impact of ICT on people, place and environment;
- Develop understanding of geographical patterns, processes and relationships;
- Deal with an enormous amount of data, texts, maps and figures;
- Simulate or model abstract or complex geographical systems or processes;
- Obtain a better view of the world and create more time in Geography lessons;
- Investigate processes that are too slow or inaccessible through simulations that allow learners to form and test hypotheses about relationships between factors;
- Access databases (such as GIS) that specify a location with particular features plotted and distribution factors shown in colours on an outline map;
- Discover the ever-fascinating story of the changing planet.

### 3.6.3 ICT and the educator in Geography

According to the Teacher Training Agency (TTA,1999) in the U.K., Van der Schee (2003:212); Bowles (2006:2) and Kennewell (2004:69-71), ICT has the potential, for the educator, to make a significant contribution to the teaching of Geography by:

- Making Geography more realistic and relevant;
- Allowing more time for observation, discussion and analysis;
- Increasing opportunities for communication and collaboration;
- Extending the range of primary and secondary sources;
- Communicating and exchanging information with people in contrasting localities;
- Helping the educator keep up-to-date in geographic subject knowledge and pedagogy;

- Saving time by providing varied and flexible resources;
- Providing a source of resources to learners; and
- Helping learners to structure and find their way through the enormous amount of continuously changing geographic information and to take optimal advantage of the opportunities that ICT can offer to geographic education.

### 3.6.4 Teaching and learning Geography effectively with the integration of ICT

As discussed in par. 3.6.1 – 3.6.3, there are various ways in which ICT supports Geography teaching and learning. Hassel (1996:77) outlined the benefits that ICT could provide, as well as presented ways in which learners studying Geography are entitled to use ICT. Between the late 1970's and early 1980's most of the research involving the integration of ICT in Geography teaching and learning was primarily classroom studies of ICT integration, CAL (computer-assisted learning), programme evaluations or how ICT can support fieldwork (Kent, 2000:160). More recently, studies undertaken by Ingram (1998) and Morris (1998) on multimedia in teaching Geography and investigating the use of the internet in teaching Geography in secondary schools have also focused on CAL in Geography education. The major aspect that all of these studies have in common is that the technology has been brought into classroom within the parameters of the existing educational situation. There has been pressure to use ICT in education and the emphasis has been on how to incorporate ICT in education to enhance teaching and learning within the existing educational situation and methods of teaching and learning (Jackson, 2000: 161).

According to Bowles (2006:2) and Storey (2002:23-24), educators can maximise the impact of using ICT in Geography by:

- being clear as to how the use of ICT will support lesson objectives;
- using ICT as a tool, not just as an information resource;
- giving learners greater autonomy in their geographical investigations; and

- incorporating the use of portable ICT equipment in teaching and learning.

Research, though limited, shows key benefits that Geography educators have been faced with in practice when utilizing ICT (Bowles, 2006:2). There is also much more literature about the advantages of introducing ICT in Geography teaching than disadvantages (Van der Schee, 2003:208). These range from the provision of hardware and software to the most effective ways to use ICT resources in a Geography classroom. Articles such as those by Garner (1997:90-91) on 'Integrating ICT into schemes of work' and Warner (1994:184-185) on 'the potential issues the integration of the CD-ROM technology in Geography' were written to support educators in using ICT to teach Geography. In more detail, authors such as Freeman (1997:202) argue that ICT can also enhance Geography teaching and learning, rather than just to fulfil legal requirements as subscribed by national governments.

Lehtinen (as quoted by Houtsonen, 2003:59) examined in 1998 the significance of the impact of modern ICT for teaching and learning in Geography. He did it by means of meta-analyses and concluded that learners in classes where ICT was used as a teaching aid generally learned more than those in other classes, performed better on average in cognitive tests, learned faster, enjoyed the lessons more and were in general happier in their academic work. Therefore, hypermedia (ICT) environments produce better results than conventional teaching environments.

In their analysis of learning by means of the GLOBUS interactive CD-ROM environmental education programme, Houtsonen and Rehunen (2000:189-193) found that more than half the learners regarded this as an interesting and different mode of studying and valued the illustrative animations and sound effects. Time tabling flexibility and the opportunity to study at one's own pace were also seen as clear benefits of the programme. The paucity of human contacts and lack of direct discussions were felt to be the main drawbacks relative to lectures. GLOBUS proved to be well adapted as a study programme for environmental education as it approaches the subject from numerous perspectives and allows ample scope for learners to think matters over for themselves (Houtsonen, 2003:59).

There are educators who are not that positive towards the integration of ICT into Geography teaching and learning in terms of specific benefits of ICT for Geography. According to Chambers (1999:151), it is clear that ICT is becoming an intrinsic part of the geographical educational armoury and as far as ICT specific educational applications are concerned, such ICTs would appear to have only superficial claims as to their capacities for supporting learning and teaching. Lewis (1999:149) states that the thinking behind the introduction of ICT has to date been limited. Its purposes have been narrowly defined as either cost-efficiency or learning effectiveness, or some balance between. Watson (2000:220) also stated that large-scale innovative users of ICT in the Geography classroom are people that are personally interested in ICT, whereas the majority of educators use IT in their classrooms only when it has a particular resonance with their pedagogic and subject philosophy. Therefore, at present it has generally been accepted that ICT should be used in the Geography classroom as a resource when it has the potential to enhance teaching and learning and empowers individuals to access a wider variety of resources (Jackson, 2000:161).

### 3.6.5 How to integrate ICT in Geography teaching and learning

Geography as a subject requires a high order thinking and an ability to compare and contrast, synthesise and simulate all the possible elements which go towards giving place meaning, both globally and locally (Bowles, 2006:3). Ryan *et al.* (2000:32-33) emphasise that learning with ICT can provide high quality teaching. One also has to take into consideration the extent and kind of educator support, the extent to which learning materials are prescribed and structured and the ways in which different kinds of media are deployed. By the end of a Geography unit in which ICT has been embedded, both the educator and learners should, according to Bowles (2006:3), be able to recognise and appreciate the role of ICT in accessing information and knowledge, fostering creativity and facilitating the exchange of ideas.

According to Freeman (1997:205-207), Kennewell (2004:68) and Bowles (2006:1) it is advantageous to use ICT in Geography teaching and learning if it can be integrated as follows:

- *A tool for inquiry learning* – ICT helps Geographers assemble, organize, analyse and present information in words, maps, diagrams and tables from both primary and secondary sources, acquiring certain ICT handling skills and enhancing their skills of geographical enquiry.
- *A resource for obtaining secondary source material* – Up-to-date information in newspapers, pictures, photographs and videos, statistics and reports, including first-hand experiences from around the world are available on CD-ROM and via the internet. These materials widen learners' experiences and provide the basis for carrying out investigations.
- *An aid in measuring physical events and situations* – Data-logging devices, such as automatic weather stations or other environmental monitors are more accurate and reliable and offer more regular continuous data than traditional methods. Students may still carry out fieldwork using traditional methods, but having the added advantage of the comparison with automatic readings.
- *Models real-world situations* – Geographers are familiar with models of the water cycle, population growth, industrial development and urban patterns of growth. ICT offers an opportunity to use and create dynamic models. It is easier to learn the principles of, for instance, industrial development if there is a computer model which may be altered and discussed.
- *Helps in communicating and presenting information* – Whether the results of geographical enquiry are generated in words, maps, diagrams, photographs, sound or video, ICT offer a means of presenting information for a variety of audiences.
- It must also deepen the understanding of environmental and spatial relationships, providing experience of alternative image, place and environment and enabling the consideration of the wider impact of IT on people, place and environment.

- Furthermore, ICT improves efficiency and pace of workload in providing resources and structure to support learning independently of the educator and improving the quality of task outcomes for learners.

Geography educators like Fisher (1998 & 2000), Freeman (1997) and Hassell (2000) have shown how ICT and Geography work together. Both Geography and ICT enable learners to manipulate (i.e. edit and visually process) images to develop an understanding of the world around them. This understanding is then exemplified through the use of data (numbers which reflect the considerable variations in weather, climate, topography, communication and culture) to highlight the similarities and differences between places and people. Unprocessed data is meaningless until displayed as graphs, diagrams and maps (Bowles, 2006:1).

## 3.7 CONCLUSION

Geography is a subject in which ICT can make a definite and worthwhile contribution and it is, therefore, important that Geography educators investigate which ICT variants will benefit their students. The internet and the World Wide Web as the most commonly used ICT variants are used progressively more as a resource-based and communication tool in teaching and learning throughout the world. It consequently alters the pedagogy and methodology of Geography teaching and learning. ICT supports teaching and learning in Geography in various ways and has an impact on the quality of students' learning experience and the depth of their learning. It can be a tool for inquiry learning, a resource for obtaining secondary source material, an aid in measuring physical events and situations, models real-world situations, help to communicate and present information, improve efficiency and pace of workload, provide resources and structure to support learning independently of the educator and improve the quality of task outcomes for students.

New learning technologies can transform the way knowledge is packaged, delivered, accessed, acquired and measured, altering higher education's core production and delivery process as students will demand flexible, targeted,

accessible learning methods, potentially altering the traditional role of Higher Education.

The challenge to utilize ICT in Geography teaching and learning effectively also presents itself within the context of globalisation and polarisation. This challenge occurs in a world where the incongruencies between the rich and poor individuals or nations are on the increase. Education around the world is at the brink of a new era where educationists are challenged to incorporate ICT in teaching and learning, in a globally competitive as well as cost effective manner. The ability, versatility and low cost of an ICT variant such as the Digital Versatile Disc (DVD) suggest that it can serve this purpose.

# CHAPTER 4

# METHOD OF RESEARCH

## 4.1 INTRODUCTION

The methodology employed in this study is discussed under the following headings:

- Literature review
- Aim of the empirical investigation
- Empirical research
  - Design
  - Participants
  - Instrumentation
  - Treatment
    - Traditional lectures
    - DVD integration
  - Data collection procedure
  - Data analysis
  - Ethical considerations

## 4.2 LITERATURE REVIEW

An extensive literature study of national and international primary and secondary sources was conducted to investigate the utilization of ICT variants and specifically the DVD or similar technology in Geography teaching and learning.

An extensive DIALOG search in the ERIC-data basis as well as the internet was conducted. A HSRC-NEXUS and RSAT search to identify typical and relative research on this topic was done.

## 4.3 AIM OF THE EMPIRICAL INVESTIGATION

To investigate and evaluate the effective integration of the DVD in Geography teaching and learning, the DVD as ICT variant was integrated into the teaching and learning of the GEOH251 Geography module at the North-West University (Potchefstroom Campus), Faculty of Educational Science. The character and number of formal lectures were altered to seminars in order to focus effectively on higher order learning (see par. 2.2.1). Furthermore, the project investigated whether the DVD could assist students successfully in a learner-centred learning environment to become autonomous learners (work independently, on their own and with success). The study also necessitates determining the nature and efficiency of the information included on the DVD and the nature and efficiency of formal lectures (seminars). The project purported that the study guide (DVD guide), study material, articles, videos, animations, photographs, diagrams, assignment guidance, formal lectures and supplementary explanations of concepts were included on a DVD and supplied to the students. (See DVDs in Appendix 4.) Each student was issued with a portable DVD player that is both battery and electrically powered, that enabled him or her to utilize the DVD at any time and place as a resource-based learning tool. The way the DVD was integrated into the teaching and learning method of the Geography module was largely determined by the way the contact sessions (seminars) were constructed.

An important aim of the project was that the students' academic performance should not be jeopardized in any way by the integration of the DVD teaching and learning method in Geography.

## 4.4 EMPIRICAL RESEARCH

### 4.4.1 Design

The action research method which, according to Henning (2004:47), is a powerful research method, was the backbone of this empirical study. The action research method included both qualitative and quantitative research components.

The qualitative component utilized various data collection methods namely, record keeping (monitoring) of contact and group session activities, semi-structured interviews, informal conversations, the researcher's field notes and students' notes, observation of the lecturer and notes of the lecturer in order to describe, interpret, verify and evaluate the gathered information pertaining to the DVD teaching and learning method.

The quantitative component, a cross-sectional study as part of a developmental research method (Leedy & Ormrod, 2005:182-183) was utilized to develop and evaluate a proposed model for the effective integration and utilization of the DVD in Geography teaching and learning (see Table 4.1). In an attempt to create a *proposed model* for the integration of the DVD in Geography teaching and learning, an *initial model* (first order model) was developed at the Faculty of Educational Sciences of the North-West University (Potchefstroom Campus). Observations by the Geography lecturer, as well as feedback received from the students in the form of questionnaires, students' notes and personal interviews with students, were analysed to bring about the necessary changes to the first order model. Once the changes were effected, the altered model was named and implemented as the *second order model.* Further adjustments were made according to observations, feedback and recommendations from the students and the lecturer, as was the case with the first order model. The *proposed model* is then the final model as a result of changes made to the second order model.

**Table 4.1 Cross-sectional study**

| Time | → | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2004 | | | | 2005 | | | | 2006 | | | | .. |
| *Group 1* | Obs | Obs | Tx | *Group 2* | Obs | Obs | Tx | *Group 3* | Obs | Obs | Tx | ... |

**(Leedy and Ormrod, 2005:183)**

Notes:

- "Obs" refers to an observation with regard to the variables and achievement of learning outcomes made.
- "Tx" refers to the presence of a change ("treatment") in the programme.

To evaluate the averages of the academic performances of the different year groups of the GEOH251 Economic Geography module, various statistical analyses and comparisons were made. A suitable method to reach this research goal was the measure of 'central tendencies', percentages and 'comparisons of means'.

### 4.4.2 Participants

The participants in this study included the entire population of the full time second year students of the Economic Geography module GEOH251 of 2004 (n = 42), 2005 (n = 31) and 2006 (n = 28) of the B.Ed (teaching degree) of the Potchefstroom Campus of the North-West University. The class composition of both year groups was heterogeneous and consisted of a near equal number of males and females. The average age of the participants varied between 19 and 20 years. More than three quarters of each year group were academic second-year students who had enrolled for Geography as their major and approximately a quarter were historically third-year students. The latter are generally students who have enrolled for Geography as their second major and, therefore, they only attend the first year Geography course during their second academic year.

### 4.4.3 Instrumentation

For the quantitative component of the study two questionnaires were used as well as the official GEOH251 module mark of the students. Various data collection methods were used for the qualitative component. The main instruments used include:

- Upon completion of the GEOH251 module for 2004, 2005 and 2006, questionnaires were completed. (See Appendix 1 and 2 for examples of the questionnaires.) The students completed the two questionnaires upon receipt of their final module mark. The final mark is comprised of two marks with a ratio of 1:1, namely the participation and final examination marks. The compilation of the participation mark included marks obtained from class tests, assignments, group activities and reporting.

  Questionnaires included questions to try and determine how the students

received, experienced and valued the DVD method, the DVD itself, DVD technology and the combination of the utilization of the DVD and the seminar. Questionnaires also included questions such as how to improve the initial and second order models for the integration of the DVD into Geography teaching and learning, as well as how to accomplish some of the research objectives.

- Personal interviews were conducted with some of the students of the 2004 (n = 4), 2005 (n = 4) and 2006 (n = 6) GEOH251 year groups. Students were selected in such a way that a range of academic performances of students was covered, namely under-average, average and above-average. The structured interviews included questions on the effective utilization of the DVD teaching and learning method, the structure of the seminar and the information as compiled on the DVD as well as the combination of the seminar and the DVD. *(See Appendix 3 for the example of the questionnaire used during the interviews.)*

- In addition to the above-mentioned instruments, various qualitative data collection methods were used, namely record keeping (monitoring) of contact and group session activities, semi-structured interviews, informal conversations, the researcher's field notes and students' notes, observation of the lecturer and notes of the lecturer. These helped determine the efficiency of the DVD method as a supportive tool in the teaching and learning in the GEOH251 module and the structure and number of seminars. The evaluation of the students' comments on the effectiveness of the information compiled on the DVD and the efficiency of the seminar structure were also taken into account.

- The analysis of the averages ANCOVA of the final mark of the GEOH251 students of 2003, 2004, 2005 and 2006 in correlation with their average M-scores. The average M-score of the students and the class average of this module of each of the above-mentioned year groups were compared. The M-score is determined by allocating a value to the Grade Twelve (matric) symbols (final school examination symbols) of each student (maximum six subjects).

Each symbol represents a value, that is, an A=5, B=4, C=3, D=2 and E=1 for subjects on the higher grade and for the standard grade an A=4, B=3, C=2 and D=1. The higher symbol of the two compulsory languages is multiplied by two. The highest M-score which a student can achieve is therefore 35 (Six distinctions or six subjects with an average over 80%). It must be noted that the M-score reflects the academic ability and not the intellectual ability. The academic average is adjusted according to the M-scores to ensure a just comparison. By utilizing the M-score, a fair comparison is made between the academic performances of the different year groups. Effect sizes (Cohen's Criterion) were subsequently utilized to determine any significant differences between the module marks.

Effect size (d) is calculated using the following formula:

$$d = \frac{\left|\bar{x}_i - \bar{x}_j\right|}{\sqrt{MSE}},$$

where where $\left|\bar{x}_i - \bar{x}_j\right|$ is the difference between $\bar{x}_1$ and $\bar{x}_2$ without taking the sign into consideration and *MSE* is the mean square error of analysis of covariance (ANCOVA).

(Ellis & Steyn, 2003:53)

- Another comparison was made by comparing the academic performance of a specific year group (the final marks across a total of eight modules over a two-year period of the Geography course). This enabled a comparison between the academic averages of the GEOH251 module that utilized the DVD method and the other seven modules of the same year group of the first two years of the Geography course.

  Effect size (d) is calculated to compare the averages and standard deviations of the different modules with the averages of the GEOH251 module using the following formula:

$$d = \frac{|\bar{x}_i - \bar{x}_j|}{s_{\max}},$$

where $|\bar{x}_i - \bar{x}_j|$ is the difference between $\bar{x}_1$ and $\bar{x}_2$ without taking the sign into consideration and $s_{\max}$ equals maximum of $s_1$ and $s_2$, the sample SD's. When no control group exists, the division by $s_{\max}$ gives rise to a conservative effect size in the sense that a practically significant result will not be concluded too easily (Ellis & Steyn, 2003:53).

### 4.4.4 Treatment

#### 4.4.4.1 CONTEXTUALIZATION OF THE GEOGRAPHY MODULE

Geography as subject consists of two main sections, namely 'Human' and 'Physical' Geography, which in turn consists of different sub-disciplines. Geography as an elective subject within the B.Ed degree consists of four quarterly modules (each with a different module code) per year for the first two years. Each module contains different content and represents a sub-discipline of Geography. The module codes are GEOH 131, 141, 151 and 161 for the first academic year and GEOH 231, 241, 251 and 261 for the second study year. The third year consists of two semester modules (GEOH 311 and 321) that represent advanced learning of the foundation received in the content of the first two years. Three Geography lecturers teach all the modules.

For practical reasons the second-year GEOH251 full time Geography module was identified for this study. The central theme of the GEOH251 module is 'Economic Geography' as sub-discipline of Human Geography.

Within the context of the B.Ed degree (training of teacher students), elective subjects should also integrate teaching and learning methodology. Each of these modules consists of eight credits that equal 80 study hours (1 credit = 10 assumed study hours). One credit should be allocated to subject methodology.

#### 4.4.4.2 LECTURES VERSUS SEMINARS

Traditionally, the number of contact sessions was twenty periods per module (i.e., four fifty-minute periods per week for five weeks). A module consists of five learning units that normally entails one learning unit per week and four contact sessions per learning unit. Traditional lectures consist of explanations and overviews of a certain topic of the content by the lecturer. Learners have to prepare for contact sessions according to the schedule as set out in the study guide received at the beginning of the module. Group discussions and reporting, as well as class discussions feature regularly (not every period) according to the schedule set out in the study guide and comprise of higher order (analysis, evaluation, synthesis) discussions. Class tests generally occur once a week. Written assignments are submitted according to the schedule set out in the study guide and comprise of higher order questions covering the learning unit. The workload and pace of learning of the students are managed on a day-to-day basis by the lecturer.

With the integration of the DVD teaching and learning method in the GEOH251 module, the number and the character of contact sessions changed. In 2004, the contact time was reduced to four contact sessions per module (once every week and a half). The first contact session was utilized as an information period. The three 90 minute contact sessions thereafter were in a seminar format. The seminars were evenly spread over the five-week course period. During each seminar session, preference was given to group and class discussions, class tests, reporting and assessment.

An adjusted method was then applied in 2005 after changes (based on feedback and recommendations received from students and observations by the lecturer) were implemented. One contact session (seminar) of two hours (with short 5 minute intervals every 30-40 minutes) was implemented on a weekly basis. More time was available for proper exercise control, group discussions, reporting and class discussions facilitated by the lecturer. The same method was applied for 2006, only with minor changes as recommended by the students and observations by the lecturer.

#### 4.4.4.3 DVD INTEGRATION

Students were issued with a portable DVD player and DVD's containing the following information: DVD study guide, basic study material, articles, videos, animations, photographs, diagrams, formal lectures and supplementary explanations of concepts. Thus, all the knowledge-level information and directions on how to prepare properly for the group and class discussions, conduct the assignments and what to study for the class tests were the students' own responsibility. This means that the DVD technology acted as a 'resource' in 'resourced-based learning'. Learner-centred learning was assumed to take place with the assistance/support of the DVD. All other research material, such as the additional reading to assist the students with their preparation for the group discussions during the seminars was available on the internet, www and computer software packages.

##### *4.4.4.3.1 Creation and compilation of the DVD*

A technical support team employed by the Faculty of Education of the North-West University (Potchefstroom Campus), helped construct the information provided on the DVD and compile the information in a certain order as indicated by the lecturer.

The hard copy of the study guide designed to guide students through a module (standard procedure for all modules) was converted into a DVD study guide (DVD guide) that led students through the workload of the module and the routes to access the additional information available on the DVD. This formed the core text (backbone) of the learning information on the DVD.

Other information inserted on the DVD accessed via a menu system at various predetermined places in the DVD guide consists of:

- Texts scanned in word format and technically altered and converted to a format that can be read on a DVD.

- Photographs, diagrams, sketches and animations (in any format) are digitally converted and inserted onto the DVD at the specific predetermined place, as indicated in the DVD guide.

- Video recordings as introduction statements, formal lectures, supplementary explanations of concepts, real life recordings and oral guidelines on how to prepare properly for the group and class discussions, conduct assignments and what to study for the class tests are also digitally manipulated and placed on the DVD at the specific place as indicated in the DVD guide.

  These recordings were done either in a studio or in an informal way by the lecturer him/herself in his/her office or in the class by means of a handy cam, as well as actual recordings of phenomena related to the content.

The 2004 year-group recommended that more lectures, explanations on certain topics and guidelines on how to do the exercises, group-work preparation and assignments should be included on the DVD. This was then implemented in the DVD compilation of 2005. More explanations and guidelines were included for each learning unit. (See DVDs in Appendix 4). No alterations were made for the 2006 year-group in this regard.

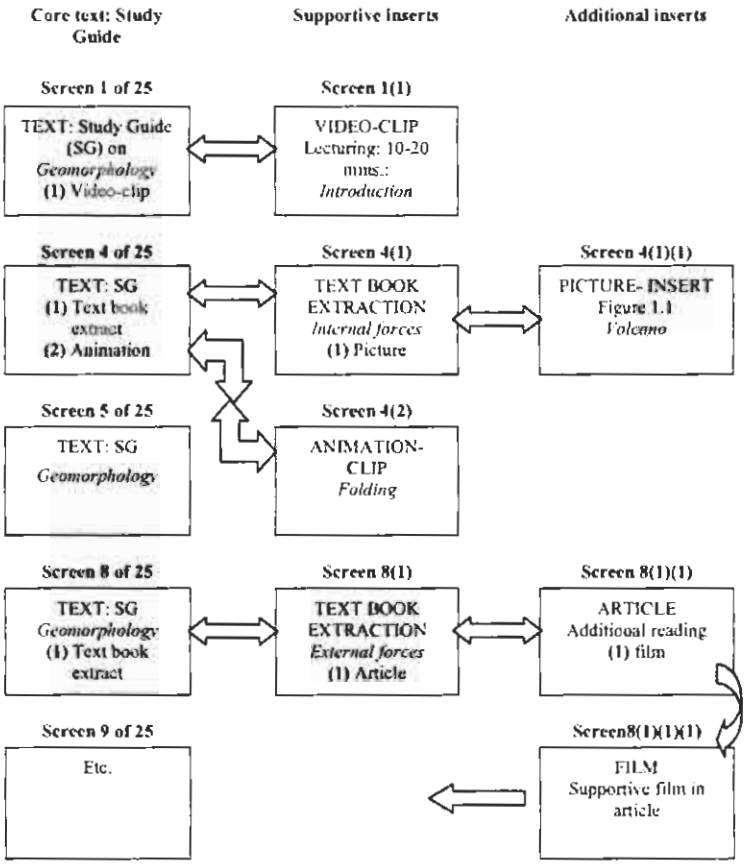
*4.4.4.3.2 Compilation of the information on the DVD and routing through it*

Figure 4.1 illustrates and explains the easy manoeuvrability of, and routing through the information (DVD guide, additional text, videos, animations and lecturers) as compiled on the DVD as described by Van der Westhuizen and Richter (2005:357) Each block in Figure 4.1 represents an example of a DVD screen and the type of information present.

The core text (DVD guide) in column 1 contains the set module outcomes, learning unit outcomes, study guidelines, exercises, assignments, group activities, possible test and examination questions, etc. similar to a hard copy study guide. Supportive inserts (column 2) are accessible through numbered menus integrated in the core

text (DVD guide). From the supportive inserts, relevant additional information can also be chosen via available menus. These menus in the core text and supportive inserts are on the appropriate screen pages and can be elected by selecting the corresponding number on the key pad of the remote control or the DVD player itself. Students have the option to choose the available supportive and additional information, or to continue with the core text.

**FIGURE 4.1 UTILIZING THE INFORMATION ON THE DVD AND MANOEUVRABILITY OF THE DVD PLAYER**




(Van der Westhuizen & Richter, 2005:357)

All text, information, inserts, etc., can be played repeatedly according to the need and learning tempo of the student. Students can, therefore, navigate freely between the screens, supportive inserts and additional inserts with the insert numbers, forward and backward buttons or up and down control buttons on the remote control or DVD player key pad. Utilizing the DVD implies that students can now manage their own study time by choosing, for example, the time they wish to listen to the lectures, integrate the core guideline text or study a video-clip on a topic not yet mastered, etc.

### 4.4.5 Data collection procedure

The data collection procedures were conducted by the researcher and processed with the help of a personal assistant and the Statistical Consultation Service of the North-West University (Potchefstroom Campus). It can be explained as follows:

- Upon completion of the GEOH251 module and once the students had received their final module marks, the questionnaires were completed during a class session. The lecturer explained the purpose of the questionnaires, read the instructions pertaining to each questionnaire as well as clarified and explained some of the more difficult questions in order to ensure that the students knew exactly what and where to answer. Students were given approximately 30 minutes to complete the questionnaires. The lecturer was available while the students were completing the questionnaires if help was needed. Students who were absent received their questionnaires at a later stage, completed them in their own time, and handed them in as soon as possible.

- Interviews with students were conducted after completion of the module, especially with the purpose of receiving their input on how to improve the DVD and the seminar for the following year-groups (2005 and 2006 respectively), in order to construct a proposed model of the integration of the DVD in Geography teaching and learning. Furthermore, the interviews focused especially on the chronological compilation of the seminar, the number of seminars and their viewpoints of the academic value of the information on the DVD and the DVD technology. Changes to the initial and second order models were made accordingly.

  The students who participated in the interviews were identified and appointments were made with them in the afternoons after classes and were conducted in the Geography class. The interviews were either tape-recorded or video-recorded in order to capture the information accurately for use at a later stage. During the interviews, the lecturer explained the purpose of the interview and asked whether the student would still be willing to participate in

the study. The students were handed an outline of the interview questions to assure them of the content and to apply their minds to what they were to answer. The lecturer then asked the questions on the questionnaire and the students answered freely.

### 4.4.6 Data Analysis

The quantitative data were analysed by means of descriptive statistics (means, percentages and comparisons of means with ANCOVA and effect sizes) to analyse the academic performance of students. The qualitative data (availability statistics) were analysed by means of descriptions of responses from students primarily for the evaluation of the integration of the DVD into Geography teaching and learning.

Statistical analysis of the students' formal academic performances: The M-scores of students were made available by the Academic Administration of the university. The data were processed and analysed together with the final module marks by the Statistical Consultation Service of the Potchefstroom Campus of the North-West University.

## 4.5 ETHICAL ISSUES

Geography students were involved throughout the process of developing a model for the effective integration and utilization of the DVD in the fulltime Geography teaching and learning course. The reasons for the implementation of the DVD in the GEOH251 Geography module were communicated to the students continuously. Students were able to consult with the lecturers at any time should they experience problems with the DVD or the content of the work. The input of students was treated as confidential and anonymous.

The Dean of the Faculty of Educational Sciences of the North-West University (Potchefstroom Campus) supported and gave permission to conduct the study.

The Dean explained the purpose of the project to the students and ensured them that no student would be forced to take part in the project.

## 4.6 CONCLUSION

According to Henning (2004:12-15), Henning *et al.* (2005:16-25) and Leedy and Ormrod (2005:20-30), the methodology of a study is important as many studies do not succeed as a result of methodological failure. In this chapter various measuring instruments were discussed, as well as providing accurate descriptions of the various steps and treatment of the DVD-method. Comparisons of means and percentages (with the help of the calculations of effect-sizes) that will be used in this study were discussed briefly, in order to facilitate the logical explanation of the results in Chapter 5.

# CHAPTER 5

## RESULTS AND DISCUSSIONS

### 5.1 INTRODUCTION

This chapter is devoted to the presentation, analysis and discussion of the data. The aim of this chapter is to attempt to address the questions posed in Chapter 1:

- Can the integration of the DVD method support the teaching and learning of Geography teacher students?
- How does the integration of the DVD alter the format, structure and number of traditional formal Geography lectures?
- What is the nature of the information on the DVD and how effective is it as perceived by the students?
- What is the effect of the utilization of the DVD in conjunction with the seminar on the academic performance of Geography teacher students?

In order to ensure a logical order of discussion, the data are discussed under the following headings:

- The integration of the DVD method as support in the teaching and learning of Geography.
- Lectures versus seminars.
- The nature and perceived effectiveness of the DVD.
- The academic performance of Geography teacher students.

### 5.2 THE INTEGRATION OF THE DVD METHOD AS SUPPORT IN THE TEACHING AND LEARNING OF GEOGRAPHY

In order to ensure a logical order of discussion of the teaching and learning of Geography via the DVD, the data are discussed under the following headings: The academic value of the DVD and its features for students and how the students perceived the integration of the DVD in Geography teaching and learning.

### 5.2.1 The academic value of the DVD and its features for students

To determine whether the integration of the DVD can support teaching and learning of Geography, the students enrolled in the GEOH251 module (2004, 2005 and 2006) were asked to evaluate the importance of multimedia equipment, such as the DVD, for the teaching and learning of Geography as well as the importance of sound, video, pictures, animations, graphics, etc. (all of these media can be included on a DVD) in their learning. Table 5.1 gives an indication of how the GEOH251 students of 2004, 2005 and 2006 valued the importance of the DVD and related multimedia features in their studies.

**Table 5.1 Importance of multimedia equipment and related features in the teaching and learning of Geography for the GEOH251 students: 2004, 2005 and 2006**

| Feature | IMPORTANCE FOR THE GEOH251 STUDENTS | | |
|---|---|---|---|
| | % 2004 | % 2005 | % 2006 |
| The utilization of multimedia equipment (e.g. Computers, CD-Rom, DVD, TV, etc.) | 81 | 94 | 93 |
| The use of sound, video, pictures, animations, graphics, etc. | 84 | 97 | 100 |

The majority of the students, 81% of the 2004 group, 94% of the 2005 group and 93% of the 2006 year-group felt that it was important to utilize multimedia equipment such as a DVD in teaching and learning. There was a great sense of importance of the use of sound, video, pictures, animations, graphics, etc. in teaching and learning as reflected by the 84%, 97% and 100% for the three year-groups respectively.

To ensure that the DVD-technology would not be an obstacle when being utilized as support for teaching and learning, it was necessary to determine the students' competency regarding the utilization of the DVD and/or related technologies. Table 5.2 shows the percentage of students in the GEOH251 module (2004, 2005 and 2006) who felt that they could utilize digital technologies such as the DVD effectively.

**Table 5.2 Effective utilization of digital technologies by GEOH251 students of 2004, 2005 and 2006**

| Effective utilization | % 2004 | % 2005 | % 2006 |
|---|---|---|---|
| Digital technologies (e.g. Videos, CD-ROM, DVD) | 87 | 92 | 89 |

Table 5.2 verifies that the majority of students in all three years (87% for 2004, 92% for 2005 and 89% for 2006) were certain that they knew how to utilize digital technologies effectively.

### 5.2.2 How the students perceived and experienced the integration of the DVD in Geography teaching and learning

A summary of the responses of questions 5 and 6 in the second questionnaire (Appendix 2), in Table 5.3 (a) indicates that in 2004, 61% of the students were initially sceptical, 21% were positive and only 18% were negative about the integration of the DVD in GEOH251. From the outset, the 2005 year-group was slightly less sceptical towards the integration of the DVD as 43% were initially sceptical, 31% were negative and 26% were positive towards it. The 2006 year-group initially perceived the integration of the DVD more or less the same as the 2004 year-group, namely 66% sceptical, 19% positive and 15% negative.

Table 5.3 (b) shows how the students of GEOH251 finally experienced or perceived the integration of the DVD.

**Table 5.3 How the GEOH251 students of 2004, 2005 and 2006 perceived and experienced the integration of the DVD**

(a)

| INITIAL VALUE OF THE DVD & ITS FEATURES | | |
|---|---|---|
| % 2004 | % 2005 | % 2006 |
| **Positive** | | |
| 21 | 26 | 19 |
| **Sceptical** | | |
| 61 | 43 | 66 |
| **Negative** | | |
| 18 | 31 | 15 |

(b)

| EXPERIENCE/PERCEPTION OF AFTER THE INTEGRATION OF THE DVD | % 2004 | % 2005 | % 2006 |
|---|---|---|---|
| **Positive or changed to Positive** | | | |
| Negative to Positive | 11 | 20 | 7 |
| Sceptical to Positive | 41 | 34 | 53 |
| Remained Positive | 14 | 11 | 11 |
| *TOTAL POSITIVE* | *66* | *65* | *71* |
| **Sceptical or changed to Sceptical** | | | |
| Negative to Sceptical | 2 | 3 | 0 |
| Remained Sceptical | 16 | 9 | 15 |
| Positive to Sceptical | 6 | 9 | 7 |
| *TOTAL SCEPTICAL* | *24* | *21* | *22* |
| **Negative or changed to Negative** | | | |
| Remained negative | 2 | 9 | 7 |
| Sceptical to negative | 6 | 0 | 0 |
| Positive to Negative | 2 | 5 | 0 |
| *TOTAL NEGATIVE* | *10* | *14* | *7* |

Sixty-six percent of the students in 2004 were more positive, 10% were negative and 24% were sceptical towards the integration of the DVD. In 2005, 65% of the students were more positive towards the integration of the DVD, 14% were negative and 21% were sceptical. The 2006 year-group was the most positive towards the integration of the DVD with 71% and only 22% sceptical and 7% negative.

From a research perspective it is noteworthy that of the initial 61% sceptical students in 2004, only 16% remained sceptical and only 2% (1 student) of the initial 18% negative students remained negative. In 2005, only 9% (3 students) of the initial 43% sceptical students remained sceptical towards the integration of the DVD and only 9% (3 student) of the initial 31% negative students remained negative. In 2006, only 15% (4 students) of the initial 66% sceptical students remained sceptical, 7% (2 students) remained negative of the initial 15%. Fifty-three percent of the students of the 2006 year-group changed from sceptical to positive towards the integration of the DVD upon completion of the GEOH251 module (see Table 5.3(b)).

Regarding the potential of the DVD to support Geography teaching and learning, the students reacted to the set questions posed in the second questionnaire (see Appendix 2) and their responses are summarized and compiled in Table 5.4.

Figures 5.1 (a), (b) and (c) were compiled from the information in Table 5.4. This enables a better comparison between the three year-groups (2004, 2005 and 2006) as well as focusing the attention separately on each of the three year-groups regarding the potential of the DVD to support Geography teaching and learning by the students of 2004, 2005 and 2006 respectively. Figure 5.1 (a, b and c) supports the information in Table 5.4 in order to make easier comparisons.

**Table 5.4 The DVD as Supportive ICT variant in GEOH251 for 2004, 2005 and 2006**

| QUESTIONS | % YES | | | % UNSURE | | | % NO | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2004 | 2005 | 2006 | 2004 | 2005 | 2006 | 2004 | 2005 | 2006 |
| 1. The DVD has the potential for more effective use of academic time. | 65 | 71 | 72 | 24 | 10 | 24 | 11 | 19 | 4 |
| 2. When used correctly the DVD is definitely advantageous. | 76 | 84 | 92 | 24 | 13 | 4 | 0 | 3 | 4 |
| 3. The DVD operates easily and it was easy to route through the work. | 70 | 63 | 86 | 27 | 18 | 7 | 3 | 19 | 7 |
| 4. The DVD is a good alternative to the computer. | 84 | 91 | 92 | 13 | 3 | 4 | 3 | 6 | 4 |
| 5. For academic reasons it is better to work on a DVD than on a computer. | 35 | 26 | 48 | 46 | 23 | 4 | 19 | 51 | 9 |
| 6. I prefer the DVD method above formal traditional lectures. | 16 | 26 | 11 | 39 | 29 | 22 | 45 | 45 | 67 |
| 7. I do not see any advantage whatsoever with the integration of the DVD instead of formal classes. | 11 | 17 | 8 | 35 | 20 | 22 | 54 | 63 | 70 |
| 8. I definitely see the DVD as a solution for teaching and learning of Geography in the future. | 58 | 74 | 88 | 37 | 13 | 8 | 5 | 13 | 4 |
| 9. The balance between the information compiled on the DVD and the seminar is correct. | 72 | 80 | 92 | 25 | 17 | 4 | 3 | 3 | 4 |
| 10. The DVD method demands much more self-discipline and better time management. | 100 | 100 | 93 | 0 | 0 | 0 | 0 | 0 | 7 |

It is evident from Table 5.4 and Figure 5.1 (a, b and c) *(question 1)* that 65% of the 2004 GEOH251 year-group, 71% of the 2005 year-group and 72% of the 2006 year-group felt that the DVD has the potential to support teaching and learning in Geography. Furthermore, 58% of the students enrolled in 2004, 74% in 2005 and 88% in 2006 of the students enrolled for the GEOH251 module saw the DVD as a possible solution for teaching and learning in future *(question 8)*.

Moreover, 84%, 91% and 92% *(question 4)* of the Geography students in 2004, 2005 and 2006 respectively felt that the DVD is a good alternative to the computer as a supportive ICT variant in teaching and learning Geography, although they were unsure as to whether the DVD could replace the computer for academic purposes *(question 5)* completely. It was only the 2006 year-group, according to Figure 5.2 (c) that were far more positive than the other two year-groups (see Figures 5.1 (b) and (c)) towards the utilization of the DVD than compared to the utilization of a computer.

Figure 5.1 (a) The DVD as supportive ICT variant in GEOH251 for 2004

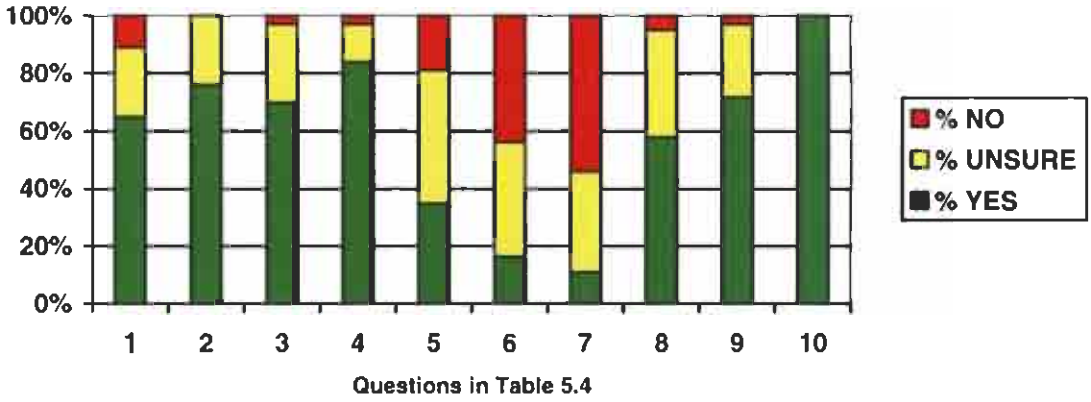



Figure 5.1 (b) The DVD as supportive ICT variant in GEOH251 for 2005

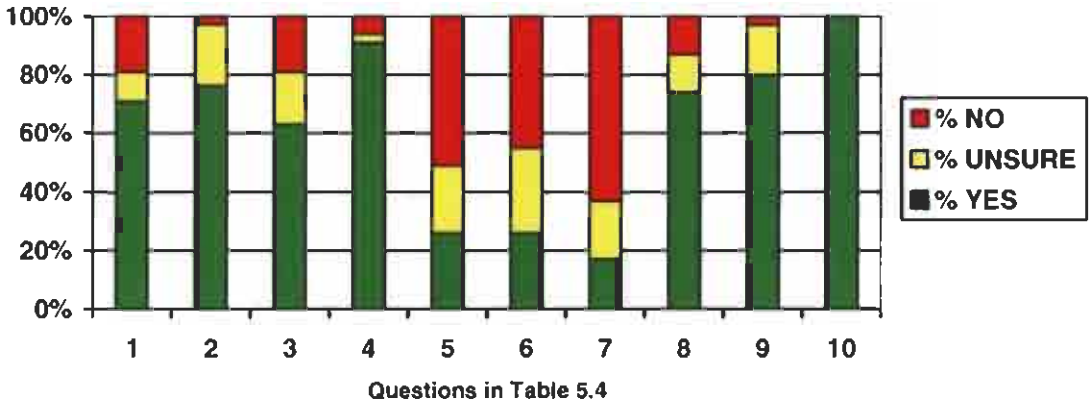
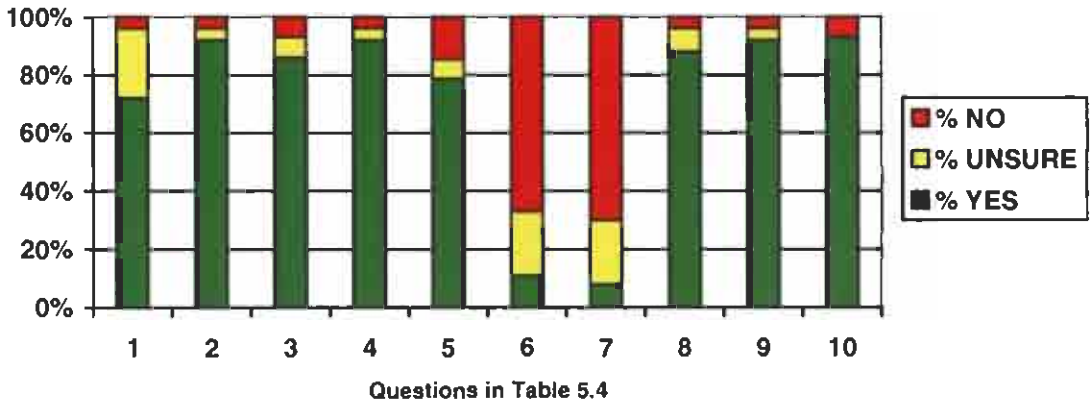



Figure 5.1 (c) The DVD as supportive ICT variant in GEOH251 for 2006



The results seem to indicate that the students were still uncertain of the integration of the DVD into Geography teaching and learning although their academic performance was not jeopardized by this method (see discussions on the students' academic performance in par. 5.5 later in this chapter). Only 16% (2004), 26% (2005) and 11% (2006) of the students *(question 6)* felt that they preferred the DVD method above traditional lectures while 39%, 29% and 22% of the students respectively were uncertain. From the personal interviews with the 2004, 2005 and 2006 students regarding this issue, it was evident that all of the interviewed students indicated that if the integration of the DVD was a teaching and learning method used in the future, they would need more and regular guidance and assistance from the lecturer, either during the seminar or on the DVD (See Appendix 3 for interview questionnaire).

All the students (100%) in the 2004 and 2005 year-groups and 93% of the 2006 year-group agreed that the DVD method called for more self-discipline and time management *(see question 10 in Table 5.4 and Figure 5.1)*. Furthermore, from the interviews and questionnaire 1, 65% (in 2004), 52% (in 2005) and 40% (in 2006) of the students confessed that they had left the work until the last minute, leaving them unprepared for the seminar sessions. Eighty-nine percent, 67% and 66% of the students in 2004, 2005 and 2006 respectively said that they would be able to manage their academic time better if they had another opportunity to utilize the DVD method.

Most of the students (70% in 2004, 63% in 2005 and 86% in 2006) were comfortable with the operation and manoeuvrability of the DVD and could access the information compiled thereon *(see question 3)*.

In 2004, 72% of the students were satisfied with the information compiled on the DVD and the workload required for the seminar *(see question 9).* During the personal interviews, the students confirmed this viewpoint and further stated that the DVD assisted them during the week in preparing well for the seminars. When answering the questionnaires, the students were asked to make some recommendations on how to improve the information on the DVD as well as how to streamline the seminars. Most of the comments were related to the need for more instructions and guidance on the DVD. The students were satisfied with the seminar proceedings.

After changes steered by the recommendations from the 2004 students, additional excerpts were made that included lectures, explanations and guidance for each learning unit. This resulted in that, upon completion of the 2005 and 2006 GEOH251 module, 80% and 92% of the students were satisfied with the information on the DVD and the seminar proceedings. No changes were deemed necessary to the seminars.

From Figures 5.1 (a), (b) and (c) it is evident that the 2006 GEOH251 year-group were more positive towards the DVD as supportive ICT variant, when the ten questions in Table 5.4 are compared among the three different year-groups. It is also obvious from Questions 7 in Figure 5.1 (a), (b) and (c) that the students who voted 'no' to the statement, 'I do not see any advantage whatsoever with the integration of the DVD instead of formal classes', increased from 54% in 2004, 63% in 2005 and 70% in 2006 as the DVD and the information compiled thereon improved each year.

## 5.3 LECTURES VERSUS SEMINARS

In 2004 with the integration of the DVD into Geography teaching and learning, contact time was changed and reduced to three seminar sessions as described in detail in par. 4.4.4.2. As mentioned, all the respondents from the second-year full-time GEOH251 students (100%) agreed that the integration of the DVD together with the seminar called for more self-discipline and time-management. Sixty-five percent confessed that they had left the work that needed to be prepared for each seminar, until the last minute, resulting in their being unprepared for the seminar sessions. Eighty-nine percent said that they would be able to manage their academic time better if they had another chance at the DVD integration method. (See Appendix 2.)

As discussed in par. 4.4.4.2, an adjusted method was then implemented in 2005 with changes steered by feedback and recommendations made by the students (mainly from the interviews). One contact session (seminar) of 2 hours was implemented on a weekly basis. This change was well received by the students as 87% reported that the four seminar sessions, supported by the DVD were, according to them, effective for Geography teaching and learning. The same format was then applied to the 2006 year-group with the same satisfactory result of 84%. Eighty percent of the students in 2005 and 93% in 2006 were satisfied with the balance between the independent

learning required by the DVD and the seminars. The combination of the seminar format and the DVD improved the efficiency of learning, pace of working through the workload and provided resources and structure to support learning independently of the lecturer. Seventy four percent of the 2005 GEOH251 and 80% of the 2006 students indicated that the same weekly format of the seminars helped them to plan and manage the workload better, 87% (2005) and 80% (2006) of the students felt that the work was divided equally across the five-week period. Seventy percent in 2005 and 72% in 2006 of the students indicated that the combined DVD-seminar-method has the potential to help students manage their academic time more effectively. (See Appendix 2 for relevant questions in the second questionnaire.)

In addition to the confirmation received from the students, as was concluded from the questionnaires, the method was also discussed during personal interviews (see Appendix 3). During personal interviews with the students of 2004, 2005 and 2006 respectively, the students were asked about their viewpoint on the chronological order of the presentation procedure of the seminar session, that is:

- Control of exercise answers with the help of peers or the facilitator.
- Class test on knowledge work.
- Group discussion 1.
- Reporting 1 and class discussion.
- Group discussion 2 and class discussion.
- Handing in of assignments.
- Receipt of next DVD and overview of the following learning unit.

Students indicated that they were satisfied with the presentation procedure. If they could recommend changes, it would be that the class test should be at the end of the seminar and that there should be one group discussion only. The majority of the students interviewed were satisfied with the seminar procedures. Change to the seminar presentation procedure was put to students (i.e., to split the seminar into two shorter contact sessions, with the same procedure with the exception that the class test would be in one session and the group discussion in the other) (See question 8 of the personal interview questionnaire – Appendix 3). All the students still preferred the initial procedure of the seminar per week.

## 5.4 THE NATURE AND PERCEIVED EFFECTIVENESS OF THE DVD

The information included on the DVD consisted of a study guide, study material, articles, videos, animations, photos, diagrams, assignment guidance, formal lectures and supplementary explanations of concepts. The aim of the questionnaires was to determine whether the DVD and the nature of the information included on the DVD were sufficient and effective. (See Appendix 4.)

Table 5.5 summarizes the evaluation of the DVD and the nature of the information included (DVD guide) by the GEOH251 students of 2004, 2005 and 2006.

**Table 5.5 Evaluation of the DVD guide and the nature of the information included thereon for 2004, 2005 and 2006 in GEOH251 by the students**

| QUESTIONS | % YES | | | % UNSURE | | | % NO | | |
|---|---|---|---|---|---|---|---|---|---|
| | '04 | '05 | '06 | '04 | '05 | '06 | '04 | '05 | '06 |
| 1. The fact that the explanations of the lecturer were on the DVD assisted me in my work. | 63 | 75 | 89 | 24 | 14 | 4 | 13 | 11 | 7 |
| 2. The video, pictures, film, etc. insertions made the work interesting and more understandable. | 68 | 80 | 89 | 27 | 14 | 4 | 5 | 6 | 7 |
| 3. The utilization of the DVD made the learning process very interesting. | 62 | 66 | 67 | 25 | 14 | 12 | 13 | 20 | 21 |
| 4. The DVD guide was a good learning aid. | 57 | 63 | 78 | 28 | 20 | 18 | 15 | 17 | 4 |
| 5. The combination of the study guide (DVD guide) video-inserts and explanations (as compiled on the DVD) were very effective. | 62 | 78 | 74 | 25 | 11 | 15 | 13 | 11 | 11 |
| 6. The combination of the study guide (DVD guide) video-inserts and explanations (as compiled on the DVD) made my work easier. | 60 | 63 | 82 | 20 | 17 | 3 | 20 | 20 | 15 |
| 7. I enjoyed the lessons on the DVD guide and found it effective. | 38 | 66 | 67 | 39 | 23 | 25 | 23 | 11 | 8 |
| 8. The utilization of the DVD guide can enhance learning or make it more effective. | 74 | 66 | 63 | 21 | 20 | 33 | 5 | 14 | 4 |
| 9. The utilization of the DVD guide can enhance teaching or make it more effective. | 76 | 71 | 74 | 19 | 9 | 22 | 5 | 20 | 4 |
| 10. I think the utilization of the DVD technology is good and stimulating for teacher training | 60 | 66 | 89 | 24 | 23 | 7 | 16 | 11 | 4 |

Figures 5.2 (a), (b) and (c) were drafted from the information in Table 5.5. This enables a better (visual) comparison of the three year-groups of 2004, 2005 and 2006 respectively and focuses on each of the three year-groups regarding the students' evaluation of the DVD guide and the nature of the information included separately.

Figure 5.2 (a) Evaluation of the DVD guide and the nature of the information included thereon for the 2004 GEOH251 students

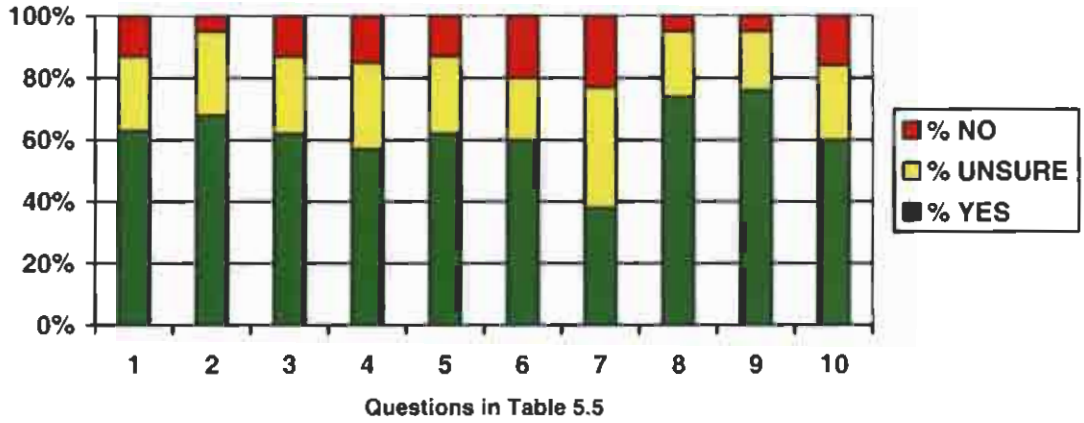



Figure 5.2 (b) Evaluation of the DVD guide and the nature of the information included thereon for the 2005 GEOH251 students

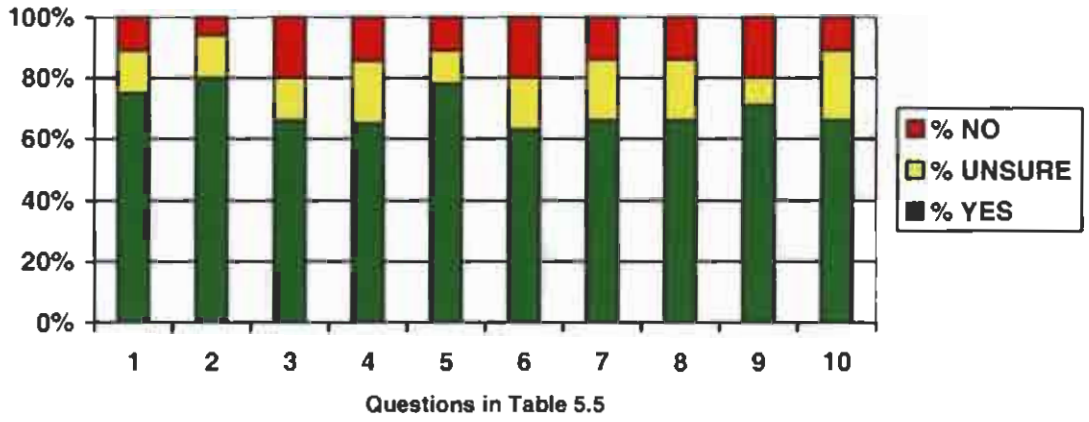
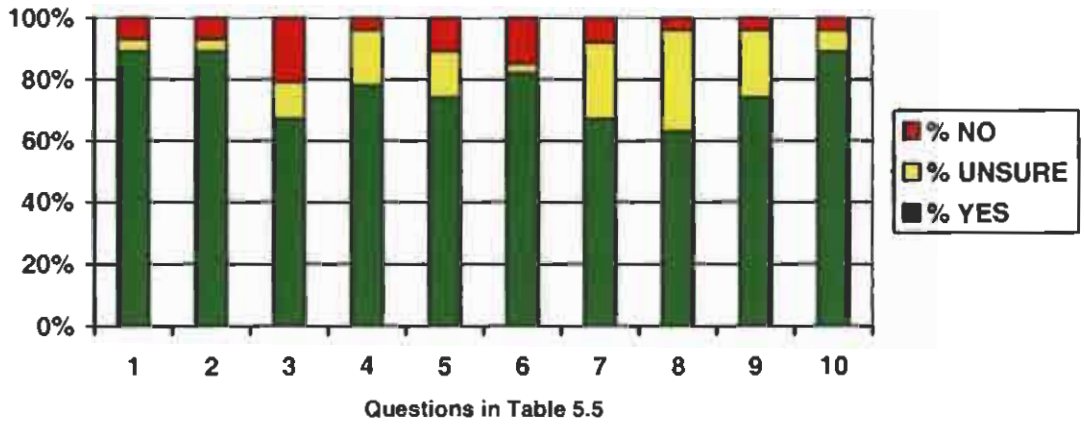



Figure 5.2 (c) Evaluation of the DVD guide and the nature of the information included thereon for the 2006 GEOH251 students



From Table 5.5 and Figures 5.2 (a), (b) and (c) the following deductions can be made: Most of the GEOH251 students (±60%) of 2004 and 2005, and 78% in 2006 experienced the DVD as an effective learning aid, found that the utilization of the DVD made the learning process interesting and thought that the utilization of the DVD technology was effective and stimulating for teacher training *(see questions 3, 4 and 10)*.

More than 60% of the GEOH251 students of 2004, 2005 and 2006 (63%, 75% and 89% respectively) deemed the explanations provided on the DVD as useful in assisting them in the completion of their work (*question 1)*. More than two thirds of the 2004 students (68%) and as high as 80% and 89% of the 2005 and 2006 students felt that the information (video, pictures, films, etc.) included on the DVD made the work interesting and understandable *(see comparison of question 2)*. A large percentage of the students in 2004 (62%), 2005 (78%) and 2006 (74%) felt that the combination of the DVD guide, video-insertions of lectures and explanations were effective *(question 5)*.

Furthermore, 74% of the students in 2004, 66% in 2005 and 63% in 2006 believed that the DVD and the information included thereon could enhance the learning of Geography or make the learning process more effective *(question 8)*. A large percentage of the GEOH251 students (76% in 2004, 71% in 2005 and 74% in 2006) felt that the DVD and the information included thereon could enhance the teaching of Geography or result in a more effective teaching process *(see question 9)*.

Upon recommendations made by the 2004 year-group to include more lectures, explanations on certain topics and guidelines on how to do the exercises, group-work preparation and assignments, the DVD compilation changed in 2005 (see DVDs in Appendix 4). This resulted in a more positive response from the 2005 and 2006 GEOH251 year-groups concerning the DVD guide, as question 1 (from 63% in 2004 to 75% in 2005 and 89% in 2006), question 2 (from 68% to 80% and 89%), question 5 (from 62% to 78% and 74%) and especially question 7 (from 38% to 66% and 67%) as stated in Table 5.5 and illustrated in Figures 5.2 (a), (b) and (c). In the first two cases (question 1 and 2 in Table 5.5 and Figures 5.2), the students of 2005 and 2006 felt that the explanations by the lecturer on the DVD not only assisted them in their

work, but also made the work more interesting and understandable. The 2005 and 2006 students found the combination of the DVD guide, video insertions and explanations included on the DVD very effective. Moreover, the 2005 and 2006 GEOH251 students found the lessons on the DVD guide more enjoyable and effective than their predecessors did in 2004.

From a comparison made between Figures 5.2 (a), (b) and (c) it is evident that the 2005 and 2006 GEOH251 year-groups evaluated the DVD guide and the nature of the information included thereon more satisfactory than the 2004 year-group did.

Table 5.6 summarizes how practical the students of 2004, 2005 and 2006 found the DVD technology when utilized for the teaching and learning of Geography. As was expected, most of the students of the GEOH251 module found the utilization of the DVD player as well as the accessibility of the information on the DVD acceptable. Although the technical team improved the quality of the text on the DVD in 2005 and more so in 2006, many students still found it difficult to read from the eight inch DVD screen. The technical support team could not enhance the clarity of text on the DVD screen as yet.

**Table 5.6 Practicality of the DVD technology for the students of GEOH251 in 2004, 2005 and 2006**

| QUESTIONS | % YES | | | % UNSURE | | | % NO | | |
|---|---|---|---|---|---|---|---|---|---|
| | '04 | '05 | '06 | '04 | '05 | '06 | '04 | '05 | '06 |
| 1. The access and manoeuvrability of the DVD is easy. | 70 | 63 | 86 | 27 | 17 | 7 | 3 | 20 | 7 |
| 2. I found it very easy to utilize the DVD player. | 70 | 78 | 75 | 25 | 11 | 13 | 5 | 11 | 12 |
| 3. I found it difficult to read from the DVD screen. | 38 | 52 | 20 | 19 | 11 | 23 | 43 | 37 | 57 |
| 4. It felt like I was wasting my time struggling with the DVD. | 19 | 23 | 15 | 24 | 11 | 28 | 57 | 66 | 57 |
| 5. I do not feel at ease with the utilization of the DVD technology. | 28 | 20 | 16 | 22 | 17 | 24 | 50 | 66 | 60 |

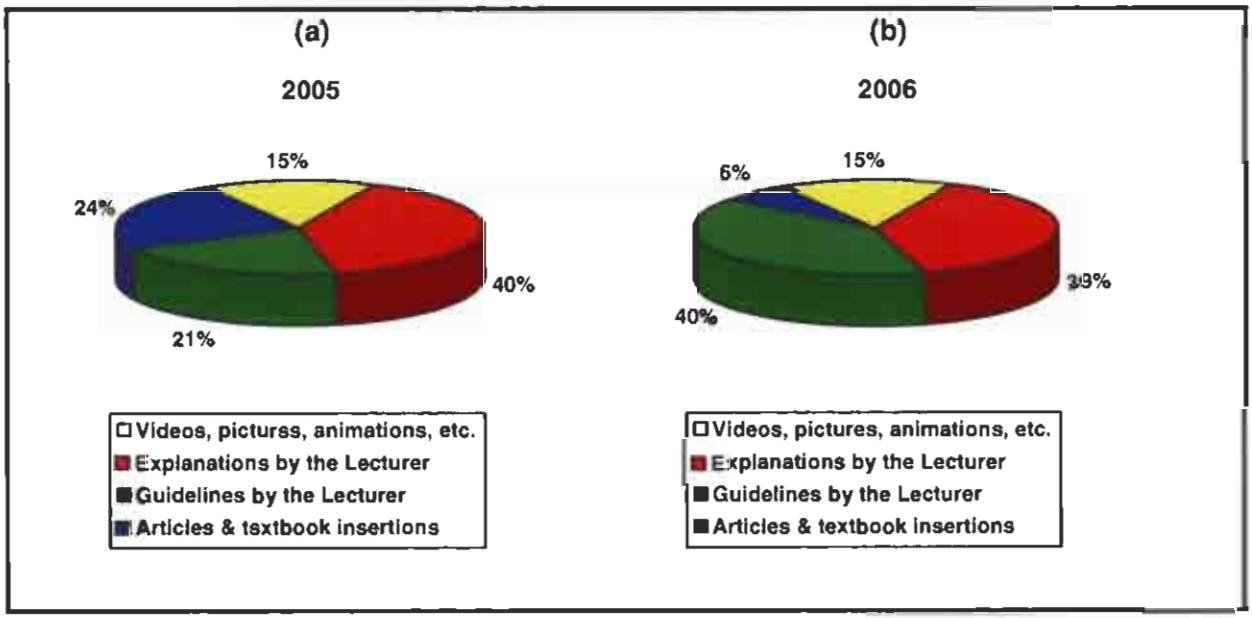
Table 5.7 lists the types of information compiled on the DVD and indicates how the students evaluated the importance of each type of information improving their academic performance in the GEOH251 module for 2005 and 2006. The information for 2004 on this particular topic is not available. Figures 5.3 (a) and (b) are graphical

representations of the information compiled in Table 5.7 and enable a comparison between the two year-groups (2005 & 2006) of the value of the information on the DVD.

**Table 5.7 Value of the information compiled on the DVD, as an aid in helping students to improve their academic performance - GEOH251 2005 and 2006**

| Information on the DVD | %2005 | %2006 |
|---|---|---|
| 1. Videos, pictures, animations, etc. | 15 | 15 |
| 2. Explanations by the Lecturer | 40 | 39 |
| 3. Guidelines by the Lecturer | 21 | 40 |
| 4. Articles & textbook insertions | 24 | 6 |

**Figure 5.3 Comparison of the value of the information compiled on the DVD as an aid in helping to improve students' academic performance**




According to Table 5.7 and Figure 5.3 (a) and (b), more or less the same percentage of students (40% of the 2005 year-group and 39% of the 2006 year-group), found the explanations of content by the lecturer as the most valuable information on the DVD. For the 2005 year-group, this was followed by an almost evenly spread percentage for 'articles and textbook insertions' (24%), 'guidelines by the lecturer' (21%) and 'videos, pictures, animations and photographs' (15%). The 2006 year-group valued the 'guidelines by the lecturer' (40%) and the 'explanations by the lecturer' (39%)

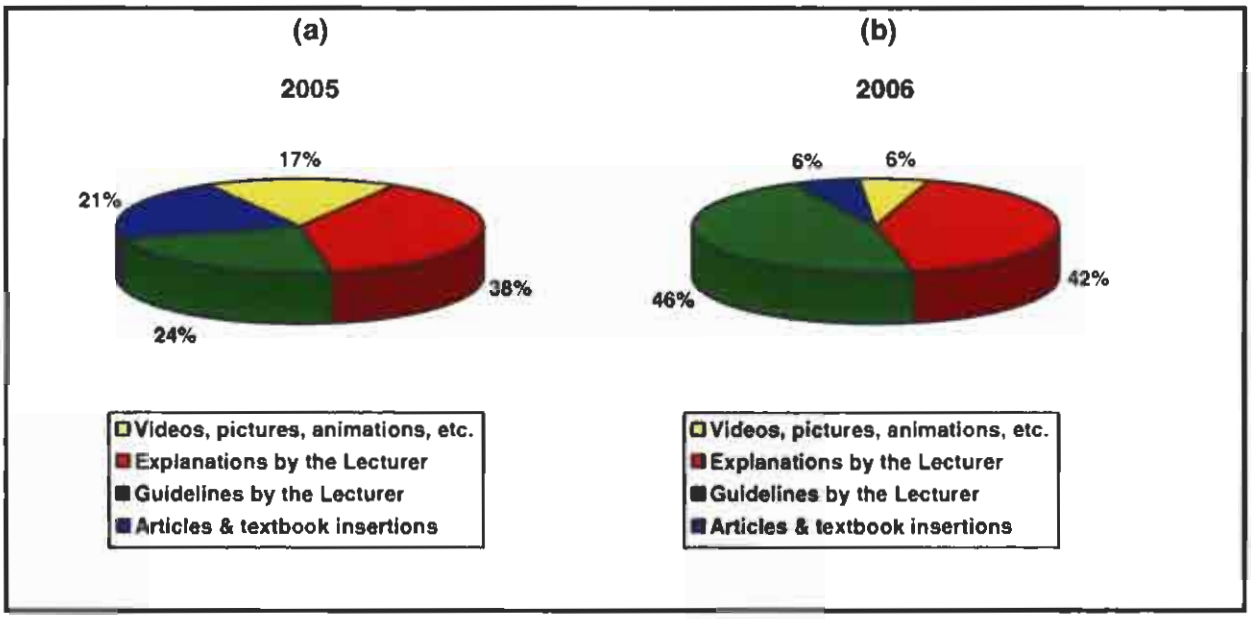
basically equal, in contrast, the 2005 year-group valued 'guidelines by the lecturer' (21%), half of that of 'explanations by the lecturer' (40%).

Table 5.8 and Figure 5.4 (a) and (b) indicate which information on the DVD saved the students of the GEOH251 module of 2005 and 2006 the most time and assisted them the most with their time management.

**Table 5.8 Value of the information compiled on the DVD, which saved the students the most time and aided in their time management - GEOH251 2005 and 2006**

| Information on the DVD | %2005 | %2006 |
|---|---|---|
| 1. Videos, pictures, animations, etc. | 17 | 6 |
| 2. Explanations by the Lecturer | 38 | 42 |
| 3. Guidelines by the Lecturer | 24 | 46 |
| 4. Articles & textbook insertions | 21 | 6 |

**Figure 5.4 Comparison of the value of the information compiled on the DVD, which saved the students the most time and aided in their time-management**




Once again 'explanations by the lecturer' (38%) were deemed to be the most valuable for the 2005 year-group, followed by the 'guidelines by the lecturer' (24%), 'articles and textbook insertions' (21%) and lastly the 'videos, pictures, animations, etc.' (17%). Concerning their time management, the 2006 year-group valued the 'guidelines by the lecturer' as the most important information on the DVD with 46% in

contrast with the 24% of the 2005 year-group, followed by the 'explanations by the lecturer' with 42%, which is more or less the same as the 39% of the 2005 year-group.

## 5.5 THE ACADEMIC PERFORMANCE OF THE STUDENTS

The purpose of this section is to report whether the integration of the DVD in Geography teaching and learning jeopardized the students' academic performance in any way.

From the second questionnaire (Appendix 2), the GEOH251 students of the 2004, 2005 and 2006 year-groups reported on their individual academic performance as follows:

- 81% of the students' marks in 2004, 75% in 2005 and 76% in 2006 were equal or better than their Geography marks of their first two years' modules;
- 76% of the students' marks in 2004, 75% in 2005 and 70% in 2006 were equal or better than their marks of other second year subjects;
- 84% in 2004, 76% in 2005 and 80% in 2006 of the students were surprised with their marks as they had done better than they had anticipated.

To determine whether the integration of the DVD was effective in the GEOH251 module for the three years of integration, the following measurement was used: To ensure a justified comparison between the year-groups, the average M-score of students in GEOH251 for 2003, 2004, 2005 and 2006 and the class average of each of the mentioned year-groups were taken into account and compared with each other in Table 5.9. This would enable a comparison between the year-group that received traditional training (2003) and the latter three year-groups had the DVD integrated in their teaching and learning of Geography.

In order to compare the scores of the students of different year-groups, an ANCOVA was performed and adjusted averages were calculated, as though their M-scores were equal (see Table 5.9).

**Table 5.9 Average *M-score, average percentage and adjusted averages of GEOH251 for 2003 – 2006**

| Year group | Number of students | Average M-score | Average in % | *Adjusted Averages* | $\sqrt{MSE}$ | Method of teaching |
|---|---|---|---|---|---|---|
| 2003 | 26 | 12.2 | 65.6 | *67.4* | 8.58 | *Traditional formal teaching* |
| 2004 | 42 | 12.3 | 63.7 | *65.4* | 8.58 | *Integration with the DVD* |
| 2005 | 31 | 13.9 | 67.4 | *67.5* | 8.58 | |
| 2006 | 28 | 18.1 | 69.6 | *66.0* | 8.58 | |

(* It must be noted that the M-score reflects the academic ability and not the intellectual ability of the then potential students.)

Effect sizes (Cohen's Criterion) were used to determine the significance of the differences between the different year-groups and are shown in Table 5.10. Effect size (d) is calculated using the following formula *(see par. 4.4.3 in Chapter 4 for details)*:

$$d = \frac{\left|\bar{x}_i - \bar{x}_j\right|}{\sqrt{MSE}}$$

The following guidelines were used in the interpretation of the effect sizes:

(a) Small effect: $0.2 \leq d < 0.5$;

(b) Medium effect: $0.5 \leq d < 0.8$; and

(c) Large effect: $d \geq 0.8$.

Differences of $d \geq 0.8$ are considered to be of practical significance (Steyn, 2000:1-3).

**Table 5.10 Effect sizes of the different year-groups of the GEOH251 module**

| Year-groups | Effect size | Methods of teaching compared |
|---|---|---|
| 2003 & 2004 | 0.23 | *Traditional formal teaching compared with the DVD method* |
| 2003 & 2005 | 0.02 | |
| 2003 & 2006 | 0.16 | |
| 2004 & 2005 | 0.25 | *DVD method compared with DVD method* |
| 2004 & 2006 | 0.07 | |
| 2005 & 2006 | 0.18 | *DVD method compared with DVD method* |

The results in Table 5.10 indicate that there are no practically significant differences among the adjusted averages of the different year-groups. Although the DVD method

was utilized in 2004, 2005 and 2006, it did not result in poorer academic performances in the GEOH251 module. (It must be noted that, although the module outcomes of the GEOH251 module are the same for all the year-groups, some variables among the different year-groups do exist, for example: different students, different examination papers, etc.)

These results, as set out in Tables 5.9 and 5.10, correlate with the findings of Hertzog and Lieble (1996:277), namely that there is no difference in the mastering of learning content by Geography students who have been trained in either the traditional approach or in the learner-centered learning approach. What is, however, noteworthy is the fact that these academic results were obtained with the integration of the DVD and the change and reduction of contact time.

To determine whether the academic average of the GEOH251 students of 2004, 2005 and 2006 correlates with the academic averages of all their completed Geography modules of their first two years of the Geography course, Table 5.11 was compiled. Table 5.11 represents the academic averages of the first eight modules (first two years of the Geography course) of 2004, 2005 and 2006, the standard deviation of the students' marks in each module as well as the effect sizes of the academic averages of each module (for each year-group) compared to the GEOH251 module wherein the DVD was integrated. This enables a fair comparison between the academic performance of the GEOH251 module (with the integration of the DVD) and the other seven modules where a traditional teaching method was followed of the same year-group. Figure 5.5 was compiled from the data (academic averages) in Table 5.11 to reflect if any abnormalities exist. Table 5.11 and Figure 5.5 give an indication of the range wherein the GEOH251 averages of 2004, 2005 and 2006 fall.

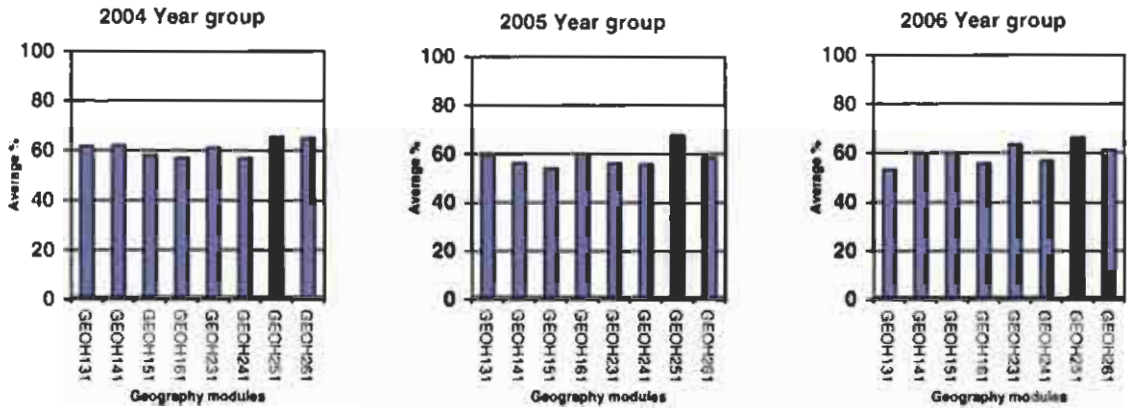
Effect size (d) is calculated to compare the averages and standard deviations of the different modules with the GEOH251 module using the following formula *(see par. 4.4.3 in Chapter 4 for details)*:

$$d = \frac{\left|\bar{x}_i - \bar{x}_j\right|}{s_{\max}}$$

**Table 5.11 Averages of Geography modules for the 2004, 2005 and 2006 year groups**

| GEOH-modules | 2004 | | | 2005 | | | 2006 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mean % | Std. dev. | (d) | Mean % | Std. dev. | (d) | Mean % | Std. dev. | (d) |
| 131 | 61.7 | 13.17 | *0.16* | 59.5 | 9.95 | *0.75* | 53.1 | 9.57 | *1.72* |
| 141 | 62.0 | 11.67 | *0.15* | 56.2 | 14.83 | *0.75* | 59.7 | 11.53 | *0.86* |
| 151 | 58.1 | 11.49 | *0.49* | 53.9 | 8.37 | *1.30* | 60.0 | 13.31 | *0.73* |
| 161 | 56.9 | 10.21 | *0.67* | 60.0 | 11.54 | *0.65* | 55.6 | 13.95 | *1.00* |
| 231 | 61.0 | 10.14 | *0.28* | 56.1 | 12.00 | *0.94* | 63.3 | 12.19 | *0.52* |
| 241 | 56.8 | 10.11 | *0.68* | 55.6 | 11.43 | *1.04* | 56.6 | 16.07 | *0.80* |
| **251** | **65.4** | **8.71** | - | **67.5** | **10.41** | - | **66.0** | **9.54** | - |
| 261 | 64.9 | 8.88 | *0.36* | 58.4 | 12.04 | *0.75* | 61.1 | 10.53 | *0.80* |

**Figure 5.5 Averages of Geography modules for the second year students of 2004, 2005 and 2006.**




According to Figure 5.5, the assumption can be made that the average of the GEOH251 modules for 2004 and 2005 are in line with the rest of the students' Geography modules over the first two years of the course. The averages of the eight Geography modules (which all have different content), taken by the students over their first two years, are all just under or just above 60%. It can be noted that the GEOH251 averages for all three year-groups have a slightly better average than the rest of the modules across the two years for each year group.

The better average of the GEOH251 module in all three year-groups resulted in the majority of medium ($0.5 \leq d < 0.8$) and large ($d \geq 0.8$) effect sizes. Differences of $d \geq 0.8$ are considered to be of practical significance (Steyn, 2000:1-3). These effect sizes give a clear indication that the GEOH251 is statistically the better average and

that the students' academic performances, when integrating the DVD method, are not jeopardized.

The overwhelming majority (87% in 2004 and 2005 and 85% in 2006) of the respondents (those who completed the questionnaire), (Appendix 2), indicated that they are of the opinion that the learning outcomes of this Geography module were successfully reached and predicted that the DVD teaching model could enhance examination results in future.

## 5.6 CONCLUSION

In conclusion, this study indicated that the majority of the GEOH251 students were positive regarding the integration of the DVD in Geography teaching and learning. The DVD method teaching approach challenges lecturers and students to fulfil new roles within the teaching and learning environment.

With regard to the questions posed in Chapter 1 and at the beginning of this chapter, the results of this study indicate the following:

- The integration of the DVD method can support the teaching and learning of Geography teacher students effectively.
- The utilization of the DVD together with a seminar format with a specific procedure enhances the teaching and learning of Geography.
- The DVD with all the different types of information thereon was well received by the Geography students and was deemed effective.
- The integration of the DVD into Geography teaching and learning evidently did not result in poorer academic performance of the students in the GEOH251 module.

The findings of this study cannot be considered ultimate answers to the research questions, instead, they point toward evidence that may help answer some of these questions.

# CHAPTER 6

# A MODEL FOR THE INTEGRATION OF DVD TECHNOLOGY INTO GEOGRAPHY TEACHING AND LEARNING

## 6.1 INTRODUCTION

This chapter is devoted to the presentation and discussion of a proposed model for the integration of the DVD into Geography teaching and learning. The aim of this chapter is to attempt to address the final question posed in Chapter 1:

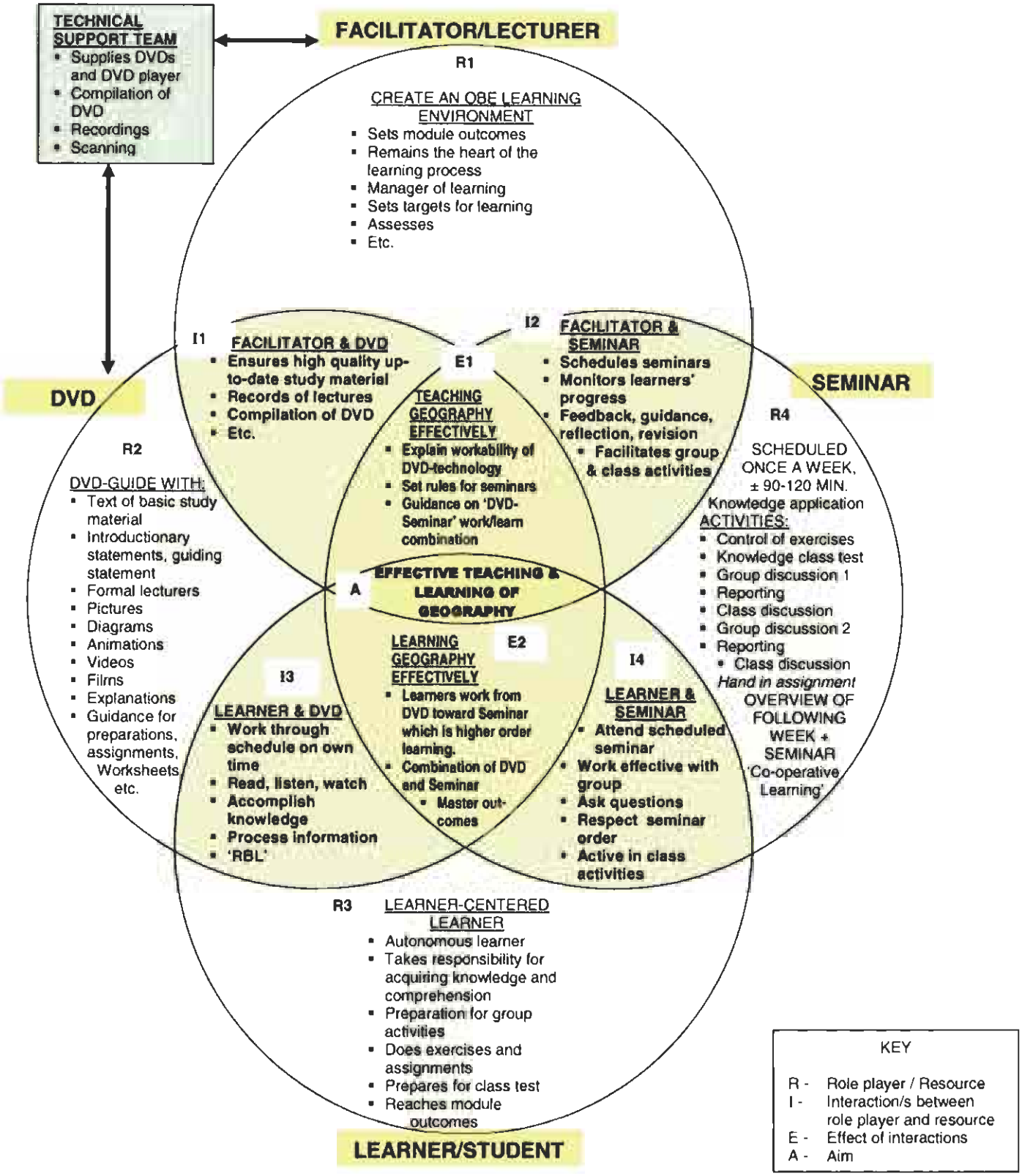
- What will a model for the effective integration and utilization of the DVD in full time Geography teaching and learning look like?

The respective roles of the lecturer, the learners, the DVD and the seminar within the proposed model are analyzed. The interaction between the different role players is also discussed as well as the consequent effects of the interactions. The proposed model is compiled based on the findings in chapter 5 and supported by the literature study in chapters 2 and 3.

## 6.2 PROPOSED MODEL FOR THE INTEGRATION OF THE DVD INTO GEOGRAPHY TEACHING AND LEARNING

Figure 6.1 illustrates the proposed model for the integration of the DVD into Geography teaching and learning. The figure summarizes the role and character of the four different role players/resources (R1 to R4) (i.e. the lecturer, who also fulfils a facilitator's role (R1) in the learning process, the DVD (R2) as a resource-based learning tool, the Learner (R3) as a learner-centred learner and the Seminar (R4) for higher order learning activities). There are different interactions (I1 to I4) between the role players/resources, namely interactions between the Facilitator and the DVD (I1), the Facilitator and the Seminar (I2), the Learner and the DVD (I3), and the Facilitator and the Seminar (I4). The effect (E1 and E2) of these interactions are the 'effective teaching and facilitation of Geography' (E1) and the 'effective learning of Geography' (E2).

**Figure 6.1** **A proposed model for the integration of the DVD in Geography teaching and learning**



The ultimate aim (A) of the proposed model is the 'effective teaching and learning of Geography'. The important role of the technical support team is discussed in par. 6.4.

### 6.2.1 The four role players/resources in the proposed model

There are four different role players or resources within the proposed model for the integration of the DVD in Geography teaching and learning that are discussed as follows:

#### 6.2.1.1 THE LECTURER/FACILITATOR (R1)

The lecturer fulfils the facilitator role within the OBE framework in which the teaching and learning of Geography will take place and remains at the heart of the learning activity. The lecturer determines the module outcomes to be reached. He/she is the ultimate manager of the learning process, setting targets for learning and creating a stable learning environment wherein teaching and learning can take place. He/she also monitors the progress of learners through various assessment strategies. The facilitator must promote learner-centred learning. The facilitator plans the learning process with the support of the DVD and the seminar (individually and in combination) in order to attain effective teaching and learning in a specific Geography module. (See par. 3.5.2 and 3.6.3.)

#### 6.2.1.2 THE DVD (R2)

Learners receive four DVDs, one for each learning unit issued at the beginning of each learning unit (see Appendix 4). Each DVD is compiled in the format of a DVD guide that is very similar to the hard-copy study guide that is issued for traditional training, with the exception of the menus for the different inserts occurring throughout the DVD guide at applicable places. The DVD guide is in text format, which is readable on a DVD player. Supportive learning material is accessed via the designated key, allocated in the core text of the DVD guide. Additional learning material/information may be in the form of text from study material, oral introductionary statements, guiding statements, formal lectures and explanations, pictures, diagrams, animations, videos, films as well as guidance for preparation on assignments, worksheets, group activities and class activities.

See also par. 4.4.4.3.2 in Chapter 4: 'Compilation of the information on the DVD and routing through it'.

#### 6.2.1.3 THE SEMINARS (R4)

The seminars are scheduled once a week and should be approximately 90 to 120 minute sessions in order to be effective within the proposed model. For the quarterly model (GEOH251) of five weeks, it is necessary to have at least one seminar for each learning unit that equals the workload of one week. During each seminar session, preference must be given to the application of acquired knowledge from the DVD, group and class discussions, class tests, reporting and assessment.

The proceeding order of the seminar is as follows:

- Control of answers to exercises with the help of peers or the facilitator.
- Class test on knowledge work.
- Group discussion.
- Reporting.
- Class discussion.
- Submitting of assignments.
- Overview of the next learning unit.

The same order procedure must be followed for each seminar session. The proceedings are briefly discussed as follows *(see DVDs in Appendix 4 for guidance and information on the seminars)*.:

##### *6.2.1.3.1 Control of exercises*

At the start of each session, students will check their completed exercises by comparing their answers with their group members' exercises. They can consult other groups or the facilitator when necessary.

#### *6.2.1.3.2 Class test*

After the successful completion of the exercise activity, a class test on the knowledge-work (lower-order cognitive skills according to Bloom in par. 2.2.1) of the learning unit of the week, based on the knowledge learning outcomes, is completed.

#### *6.2.1.3.3 Group work and discussions*

After a short break of approximately five minutes, the group discussions follow the class test according to the guidelines set out on the DVD guide. Students prepare for group discussions, as set out on the DVD guide, before attending the seminar. During the group discussions, students prepare a written/draft report to be used in the 'reporting session' following the 'group discussions'.

#### *6.2.1.3.4 Reporting and class discussions*

A class discussion facilitated by the lecturer takes place when the different groups report on their allocated topics, as discussed in their own group, in order for the other groups to evaluate and comment thereon.

#### *6.2.1.3.5 Closure activities of the seminar*

At the end of each seminar session, an overview of the following week's activities and seminar is then highlighted. The students now receive the next DVD that contains the following week's workload. During the seminar session, completed written assignments as instructed in the DVD guide, are submitted. The reports from the group discussions can also be assessed by the lecturer and mark allocated.

### 6.2.1.4 THE LEARNER/STUDENT (R3)

The facilitation of learner-centred learning is the aim of the proposed DVD model as the purpose is to assist learners in becoming autonomous learners. Learners take the

responsibility of acquiring knowledge and comprehension of the study material as compiled in the DVD in their own time and at their own pace while preparing for the forthcoming seminar and its related activities. The learners have to do their preparation for the group activities as a component in the seminar according to the lecturer's guidance on the DVD. The learners need to do the exercises and the assignment for the learning unit each week to be submitted and controlled by the lecturer or peer group. Learners have to prepare for the class test written during the seminar session. The ultimate aim is that learners will reach the set learning outcomes of the specific learning unit of the module. (See also par. 3.5.1 and 3.6.2.)

### 6.2.2 Interactions within the proposed model

The interactions within the proposed model as illustrated in Figure 6.1 are where a role player and a resource overlap (i.e. where the two interact). There are different interactions (I1 to I4) between the role players/resources in the proposed model, namely, between the Facilitator and the DVD (I1), the Facilitator and the Seminar (I2), the Learner and the DVD (I3), and the Learner and the Seminar (I4). When integrating the DVD together with the seminar in the teaching and learning of Geography, the following interactions must take place and are discussed below:

#### 6.2.2.1 THE FACILITATOR AND THE DVD (I1)

The facilitator is the sole responsible person for the compilation of the content and material on the DVD. The facilitator, therefore, ensures the:

- Compilation of high quality, up-to-date study material on the DVD.
- Organisation of recordings of lectures, explanations and guidance-inserts either done by him/herself or with the help of the technical support team.
- Planning recordings of prepared lectures in a recording friendly environment to be included on the DVD in such a way that it can replace the formal class lecture effectively.
- Provision of suitable animations, videos, diagrams and photos to support the learning material to be inserted on the DVD.

- Correct chronological compilation of the DVD and all the relevant information thereon.
- Correct and smooth functionability of the DVD and accessibility of the information on the DVD to enhance effective learning.

#### 6.2.2.2 THE FACILITATOR AND THE SEMINAR (I2)

The facilitator determines the time and place of the seminar that best suits the learners according to the existing allocated Geography periods on the timetable. Regarding the seminar, the facilitator is responsible for the following:

- Schedule the seminar and ensure sufficient time to complete all the seminar activities – i.e. utilize scheduled double or triple periods, or a combination of a group activity period with a formal academic period. The scheduled time must suit all the students enrolled for the specific module.
- Monitor learners' progress while they engage in the different activities during the seminar and assess by means of the class tests, assignments, group discussions and group reports.
- Provide continious feedback, guidance, reflection, revision and additional explanations to the learners when deemed necessary or when requested by the learners.
- Facilitate group and class activities as well as group and class discussions and reports.

#### 6.2.2.3 THE LEARNER AND THE DVD (I3)

The learner is responsible to obtain the DVD player from the technical support team at the allocated time and place. The learner makes sure that the DVD equipment functions correctly as well as familiarizing him/herself with the operation of the DVD player by attending the information (first) period and consulting the technical support team or the lecturer. A learner must ensure that he/she knows exactly how the DVD guide is compiled, how to access the information thereon and how to obtain/access the inserts (i.e. familiarise him/herself with the different manoeuvring procedures on the DVD). The

learner utilizes the DVD to support his/her independent learning process. Furthermore, the learner needs to do the following:

- Work through the information compiled on the DVD at his/her own time and his/her own pace in preparation for attending the following seminar.
- Read, listen, watch and study all the various information excerpts as compiled on the DVD. In doing so, the student can ensure that he/she acquires the basic knowledge that is necessary to reach the learning outcomes of that specific learning unit.
- Acquire knowledge in his/her own time and at his/her own pace.
- Process the information with the help of the guidelines set out on the DVD to ensure preparedness for the forthcoming seminar.
- Study for the class test by studying all the given information on the DVD.
- Apply the principles of 'RBL'.

#### 6.2.2.4 THE LEARNER AND THE SEMINAR (I4)

The learner ensures that he/she knows where and when to attend the next seminar. Seminars are compulsory as most of the participation marks are obtained during these sessions. Learners must know exactly what they need to do in order to be prepared for the seminar, as well as what to submit during the seminar. Furthermore, in order for the seminar to be effective, the learner must ensure the following:

- Attend all scheduled seminars.
- Work effectively with group members and contribute effectively to the set group activity.
- Ask questions to group members, other class members and the facilitator to ensure the mastering of the learning outcomes.
- Respect seminar procedures.
- Be an active member in class activities and class discussions.
- Use the seminar as platform to master higher order learning outcomes as specified in the learning unit.
- Use each seminar to help master the learning outcomes of each learning unit.

### 6.2.3 The effect of the interactions between the resources/role players

The effect (E1 and E2) of the interactions described in par. 6.2.2 are 'teaching Geography effectively' (E1) and 'learning Geography effectively' (E2) and can be discussed as follows:

#### 6.2.3.1 THE FACILITATOR, THE DVD AND THE SEMINAR (E1)

The cumulative effect of the actions of the Facilitator, the DVD and the Seminar as they overlap and ultimately lead to 'effective teaching of Geography' is illustrated in Figure 6.1. In order to ensure the effective teaching of Geography, the facilitator must combine the DVD, the seminar and his/her own actions effectively to the benefit of the learner and his/her comprehension of the work. The lecturer (facilitator) must focus on the following activities when the DVD and the seminar are used together:

- Explain the function of the DVD technology, the information compiled and routes on the DVD to all enrolled students during the first contact session.
- Set clear rules and guidelines for seminars (disciplinary rules and operational rules) and ensure that they are continuously executed properly.
- Provide guidance on the combination of the 'DVD' and the 'seminar' as teaching and learning resources.
- Effectively facilitate the learners towards the understanding of the DVD-learning goals (basic knowledge) and the seminar learning goals (higher order learning) as well as the transition from DVD learning to the seminar learning opportunities.
- Provide clear guidance on the DVD and the seminar or the combination thereof on how to reach the set module/learning unit outcomes.

#### 6.2.3.2 THE LEARNER, THE DVD AND THE SEMINAR (E2)

The cumulative effect of the actions of the Learner, the DVD and the Seminar as they overlap and ultimately lead to 'effective learning of Geography' is illustrated in Figure 6.1. To ensure the effective learning of Geography, the learner must combine the DVD, the seminar and his/her own actions effectively to achieve the learning outcomes. The

learner must ensure that the following activities are performed when the DVD and the Seminar are used together:

- Learners work from the DVD (containing all the necessary basic knowledge applications) towards the Seminar that contains activities suitable for higher order learning.
- The combination of the learning material and information on the DVD must be completed and the Seminar activities performed in order to reach the set learning outcomes.

## 6.3 LEARNER SUPPORT

During the formal scheduled contact sessions (periods) as indicated on the formal timetable of the Faculty of Educational Sciences, students have the opportunity to consult with the lecturer for help/information on the DVD and the Seminar. This is additional to the time available for consultation with the lecturer and co-learners during the seminars. The lecturer can also call upon students and consult with them in order to monitor their academic progress in the specific Geography model. Students who do not need assistance continue with their work on their own time and at their own pace during the week.

## 6.4 TECHNICAL SUPPORT TEAM

The technical support team employed by the Faculty of Educational Science of the North-West University (Potchefstroom Campus) helps to compile the information on the DVD in the order required by the lecturer. The supporting role of the technical team consists of the following:

- Supply DVDs and DVD players.
- Compilation and conversion to DVD format of all the types of information (animations, diagrams, photos, videos, recordings, etc.).
- Video recording of lecturers, explanations, introductionary statements, etc., as performed by the lecturer at various times and different places.

- The scanning of any non-digital text material in order to digitise it for use on the DVD.
- Assist learners with any technical support relating to the operation of DVD player and DVD.
- Take responsibility for the DVD equipment, issuing students with the DVD players at the beginning of the specific module and collecting them again afterwards.
- Record keeping of DVD equipment and DVDs issued.

## 6.5. CONCLUSIONS

The proposed model provides clear guidelines on how to integrate the DVD in Geography teaching and learning. It explains how the DVD should be compiled, what to include on it and how to utilize it in conjunction with the seminars effectively. The model also describes change of formal contact sessions to seminars, which occurs less than traditional contact time but with regular weekly intervals, as well as explains the seminar proceedings, interactions and timeframes.

The DVD can be integrated into Geography teaching and learning effectively if the procedures, steps and actions, as set out in this proposed model, are applied. The advantages of the DVD as ICT variant in Geography teaching and learning can be clearly seen especially if it can be implemented in developing countries.

## 6.6 RECOMMENDATIONS

Further research possibilities as derived from this study, on how to integrate the DVD into Geography teaching and learning include the following aspects:

- What kind of guidance should be provided to learners regarding time-management and learner support when using the DVD technology?
- What type of material should be included on the DVD to realize effective teaching and learning in Geography?
- How should the material be compiled on the DVD to ensure a proper cognitive load?

- What is the desirable balance between the nature of the information compiled on the DVD and the nature of formal lectures/seminars in Geography teaching and learning?
- What are the possibilities of utilizing this model for off-campus/distance learning in Geography teaching and learning?
- How may the DVD model be utilized to reduce contact time and promote learner-centred learning further?

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# APPENDIX 1

# A Attitude towards DVD training

Use the scale below to indicate your attitude towards DVD training. Please be honest about how you feel, there are no right or wrong answers.

| Disagree | | Unsure | | Agree |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

1. I am able to work independently (on my own).
2. I prefer a paper study guide to a DVD study guide.
3. I do not feel comfortable with the use of the DVD.
4. I prefer to attend classes so that the lecturer may lead me.
5. I found it easy to use the DVD.
6. I think the DVD guide made my learning more effective.
7. With the DVD I procrastinated with my work and did not work independently, every day.
8. The DVD guide enriched my learning experience.
9. I found it difficult to read from the DVD screen.
10. I feel that I lost valuable time when I battled with the DVD.
11. The use of the DVD made learning very interesting.
12. I really enjoyed using the DVD.
13. The DVD was a good aid when studying.
14. I think the use of the DVD player and DVD study guide is good and stimulating in teaching training.
15. I enjoyed the lessons presented on the DVD very much.
16. If we use the DVD study guide we can reduce contact time with the lecturers.
17. The use of the DVD study guide can improve/make learning more effective.
18. The use of the DVD guide can improve/make teaching more effective.
19. The use of the DVD guide makes me feel involved.

20. The use of the DVD guide helps to provide a better learning experience.
21. The use of the DVD can make a class more interesting.
22. The use of the DVD guide helps a student to learn more.
23. The use of the DVD guide increases motivation.

## Attitude towards the DVD guide

**Use the scale below to evaluate how you feel about the following aspects.**

**A) To me the DVD guide is:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | important | 1 | 2 | 3 | 4 | 5 | 6 | 7 | unimportant |
| 2. | uninteresting | 1 | 2 | 3 | 4 | 5 | 6 | 7 | interesting |
| 3. | relevant | 1 | 2 | 3 | 4 | 5 | 6 | 7 | irrelevant |
| 4. | exciting | 1 | 2 | 3 | 4 | 5 | 6 | 7 | boring |
| 5. | meaningless | 1 | 2 | 3 | 4 | 5 | 6 | 7 | meaningful |
| 6. | appealing | 1 | 2 | 3 | 4 | 5 | 6 | 7 | unappealing |
| 7. | fascinating | 1 | 2 | 3 | 4 | 5 | 6 | 7 | everyday |
| 8. | worthless | 1 | 2 | 3 | 4 | 5 | 6 | 7 | worthy |
| 9. | unnecessary | 1 | 2 | 3 | 4 | 5 | 6 | 7 | necessary |

B) Mention any **POSITIVE** aspects with regard to the DVD player and the DVD guide to which you wish to draw the lecturer's attention:

_____

_____

_____

_____

_____

_____

_____

C) Mention any **NEGATIVE** aspects with regard to the DVD player and the DVD guide to which you wish to draw the lecturer's attention: :

## B Attitude towards E-mail, the Internet, sound, image, text, etc. and Multimedia.

**Use the scale below to evaluate how you feel about the following aspects.**

**A) To me E-mail is:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | important | 1 | 2 | 3 | 4 | 5 | 6 | 7 | unimportant |
| 2. | uninteresting | 1 | 2 | 3 | 4 | 5 | 6 | 7 | interesting |
| 3. | relevant | 1 | 2 | 3 | 4 | 5 | 6 | 7 | irrelevant |
| 4. | exciting | 1 | 2 | 3 | 4 | 5 | 6 | 7 | boring |
| 5. | meaningless | 1 | 2 | 3 | 4 | 5 | 6 | 7 | meaningful |
| 6. | appealing | 1 | 2 | 3 | 4 | 5 | 6 | 7 | unappealing |
| 7. | fascinating | 1 | 2 | 3 | 4 | 5 | 6 | 7 | everyday |
| 8. | worthless | 1 | 2 | 3 | 4 | 5 | 6 | 7 | worthy |
| 9. | unnecessary | 1 | 2 | 3 | 4 | 5 | 6 | 7 | necessary |

**B) I find using the internet as:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | important | 1 | 2 | 3 | 4 | 5 | 6 | 7 | unimportant |
| 2. | uninteresting | 1 | 2 | 3 | 4 | 5 | 6 | 7 | interesting |
| 3. | relevant | 1 | 2 | 3 | 4 | 5 | 6 | 7 | irrelevant |
| 4. | exciting | 1 | 2 | 3 | 4 | 5 | 6 | 7 | boring |
| 5. | meaningless | 1 | 2 | 3 | 4 | 5 | 6 | 7 | meaningful |
| 6. | appealing | 1 | 2 | 3 | 4 | 5 | 6 | 7 | unappealing |
| 7. | fascinating | 1 | 2 | 3 | 4 | 5 | 6 | 7 | everyday |
| 8. | worthless | 1 | 2 | 3 | 4 | 5 | 6 | 7 | worthy |
| 9. | unnecessary | 1 | 2 | 3 | 4 | 5 | 6 | 7 | necessary |

**C) To me the use of sound, videos, pictures, animation, graphs etc are:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | important | 1 | 2 | 3 | 4 | 5 | 6 | 7 | unimportant |
| 2. | uninteresting | 1 | 2 | 3 | 4 | 5 | 6 | 7 | interesting |
| 3. | relevant | 1 | 2 | 3 | 4 | 5 | 6 | 7 | irrelevant |
| 4. | exciting | 1 | 2 | 3 | 4 | 5 | 6 | 7 | boring |
| 5. | meaningless | 1 | 2 | 3 | 4 | 5 | 6 | 7 | meaningful |
| 6. | appealing | 1 | 2 | 3 | 4 | 5 | 6 | 7 | unappealing |
| 7. | fascinating | 1 | 2 | 3 | 4 | 5 | 6 | 7 | everyday |
| 8. | worthless | 1 | 2 | 3 | 4 | 5 | 6 | 7 | worthy |
| 9. | unnecessary | 1 | 2 | 3 | 4 | 5 | 6 | 7 | necessary |

**D) To me the use of multimedia (e.g. Computer, CD-Rom, DVD, TV) is:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | important | 1 | 2 | 3 | 4 | 5 | 6 | 7 | unimportant |
| 2. | uninteresting | 1 | 2 | 3 | 4 | 5 | 6 | 7 | interesting |
| 3. | relevant | 1 | 2 | 3 | 4 | 5 | 6 | 7 | irrelevant |
| 4. | exciting | 1 | 2 | 3 | 4 | 5 | 6 | 7 | boring |
| 5. | meaningless | 1 | 2 | 3 | 4 | 5 | 6 | 7 | meaningful |
| 6. | appealing | 1 | 2 | 3 | 4 | 5 | 6 | 7 | unappealing |
| 7. | fascinating | 1 | 2 | 3 | 4 | 5 | 6 | 7 | everyday |
| 8. | worthless | 1 | 2 | 3 | 4 | 5 | 6 | 7 | worthy |
| 9. | unnecessary | 1 | 2 | 3 | 4 | 5 | 6 | 7 | necessary |

## DVD-Project

Surname: ..... Initials: .....

| University number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|

## Biographical Information

Age

| | |
|---|---|

Sex

| | |
|---|---|
| Male | 1 |
| Female | 2 |

Home Language

| | |
|---|---|
| Afrikaans | 1 |
| English | 2 |
| Other | 3 |

## Attitude towards DVD training

Use the following scale when answering the questions:

**Disagree** **Unsure** **Agree**

**1** **2** **3** **4** **5**

**Only one mark per item is allowed.**

| | | | | | |
|---|---|---|---|---|---|
| 1. | 1 | 2 | 3 | 4 | 5 |
| 2. | 1 | 2 | 3 | 4 | 5 |
| 3. | 1 | 2 | 3 | 4 | 5 |
| 4. | 1 | 2 | 3 | 4 | 5 |
| 5. | 1 | 2 | 3 | 4 | 5 |
| 6. | 1 | 2 | 3 | 4 | 5 |
| 7. | 1 | 2 | 3 | 4 | 5 |
| 8. | 1 | 2 | 3 | 4 | 5 |
| 9. | 1 | 2 | 3 | 4 | 5 |
| 10. | 1 | 2 | 3 | 4 | 5 |
| 11. | 1 | 2 | 3 | 4 | 5 |
| 12. | 1 | 2 | 3 | 4 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| 13 | 1 | 2 | 3 | 4 | 5 |
| 14 | 1 | 2 | 3 | 4 | 5 |
| 15 | 1 | 2 | 3 | 4 | 5 |
| 16 | 1 | 2 | 3 | 4 | 5 |
| 17 | 1 | 2 | 3 | 4 | 5 |
| 18 | 1 | 2 | 3 | 4 | 5 |
| 19 | 1 | 2 | 3 | 4 | 5 |
| 20 | 1 | 2 | 3 | 4 | 5 |
| 21 | 1 | 2 | 3 | 4 | 5 |
| 22 | 1 | 2 | 3 | 4 | 5 |
| 23 | 1 | 2 | 3 | 4 | 5 |
| | | | | | |

# APPENDIX 2

**GEOH 251** **DVD-PROJECT** **Student number**_____

**NAME** _____

1. My marks are better than my marks in other Geography modules this far.

| YES | NO | MORE OR LESS THE SAME |
|---|---|---|

2. My marks are better than other second year modules this far.

| YES | NO | MORE OR LESS THE SAME |
|---|---|---|

3. I was surprised at my GEOH251 mark YES / NO as it was BETTER / WEAKER than I had expected.

4. The DVD method forced me to work MORE than normal in the GEOH or any other module. YES / NO

5. I was initially *sceptical / negative / positive* about the DVD working method.

6. Since seeing my final mark I am more *positive / negative / sceptical* about the DVD working method.

7. The DVD method demands self-discipline and time management.

| YES | NO | UNSURE |
|---|---|---|

8. I managed my time effectively and did not leave it for last.

| YES | NO | UNSURE |
|---|---|---|

9. The DVD has possibilities/ the potential to help me use my academic time better and more effectively.

| YES | NO | UNSURE |
|---|---|---|

10. The work was evenly distributed across the 5 weeks.

| YES | NO | UNSURE |
|---|---|---|

11. The same weekly format of the seminars assisted me to plan and control my work better.

| YES | NO | UNSURE |
|---|---|---|

12. The working method, as it was my first time, caught me off guard and I was unable to do everything.

| YES | NO | UNSURE |
|---|---|---|

13. I shall be better prepared the next time and will approach the DVD module differently.

| YES | NO | UNSURE |
|---|---|---|

14. When used correctly the DVD can definitely be advantageous.

| YES | NO | UNSURE |
|---|---|---|

15. The fact that the lecturer's explanations are on the DVD helped me to complete my assignments better.

| YES | NO | UNSURE |
|---|---|---|

16. The video / pictures / animation inserts make the work more interesting and more understandable.

| YES | NO | UNSURE |
|---|---|---|

17. The DVD functions easily and I was able to move through the work easily.

| YES | NO | UNSURE |
|---|---|---|

18. The combination of the study guide, video inserts and explanations on the DVD (all together) made my work easier.

| YES | NO | UNSURE |
|---|---|---|

19. The combination of the study guide, video inserts and explanations on the DVD (all together) were very effective.

| YES | NO | UNSURE |
|---|---|---|

20. I still prefer books and formal lessons.

| YES | NO | UNSURE |
|---|---|---|

21. The DVD as ICT variant should rather strongly support formal classes.

| YES | NO | UNSURE |
|---|---|---|

22. I see absolutely no advantage of using the DVD instead of formal classes.

| YES | NO | UNSURE |
|---|---|---|

23. The DVD is a good ICT alternative for someone who does not have a computer.

| YES | NO | UNSURE |
|---|---|---|

24. For academic reasons it is better to work on the DVD than on the computer.

| YES | NO | UNSURE |
|---|---|---|

25. I surely see the DVD as an effective aid of teaching and learning for the future.

| YES | NO | UNSURE |
|---|---|---|

26. Which information on the DVD had the most value to me to improve my achievement? *(Mark 1st choice with a **1** and 2nd choice with a **2**)*

| Study guides | Videos, pictures and animations | Explanations by the lecturer | Guidelines by the lecturer on assignments | Articles- & textbook insets |
|---|---|---|---|---|

27. Which information saved me the most time and helped me to manage my time myself?

| Study guides | Videos, pictures and animations | Explanations by the lecturer | Guidelines by the lecturer on assignments | Articles- & textbook insets |
|---|---|---|---|---|

28. The four seminar sessions were effective for teaching and learning.

| YES | NO | UNSURE |
|---|---|---|

29. It would have been better if the 4 seminar sessions were divided in 8 shorter seminar sessions and that 2 a week took place.

| YES | NO | UNSURE |
|---|---|---|

30. The balance between the information on the DVD and the information received in class was correct.

| YES | NO | UNSURE |
|---|---|---|

31. I feel that all module outcomes were successfully reached.

| YES | NO | UNSURE |
|---|---|---|

# APPENDIX 3

**PERSONAL INTERVIEWS** (from the 2nd and 3rd year groups of 2004, 2005 and 2006)

QUESTIONNAIRES FOR PERSONAL INTERVIEW WITH STUDENTS

1. How does the DVD teaching approach followed in the recent term in Geography compare with other subjects or learning areas that you are / were involved? And whereby ICT is involved.

2. The fact that the lecturer offered fewer contact lectures, has resulted in students in GEOH251 having to take a greater responsibility in their own learning. Do you think it led to greater meaningful, effective learning? Tell how you experienced the learning approach and how it influenced your own learning.

3. "Contact time was not truly less but rather different as a result of the DVD" What do you think of this statement?

4. Was the chronological composition (format) of the seminar beneficial for learning? How would you change the range/composition to make it more effective? **Or** Do you think it was effective?

5. On the grounds of the learning experience in the teaching section of Geography, do you feel sure that the learning outcomes were successfully attained?

6. How did you experience the "seminar" composition? Too long, perfect or short? What would you recommend to improve it?

   - controlling of exercises
   - class tests
   - group discussions 1
   - reporting 1 + class discussions
   - group discussions 2
   - reporting 2 + class discussions
   - receive next DVD and preview

   What do you think of this formal session? Was it well supported by the DVD?

7. How did the above effect your preparation and when did you prepare?

8. What would you think if the seminar was divided as follows:

| | |
|---|---|
| session 1 (Tues.) | control questions |
| | group discussion 1 |
| | reporting 1 + class discussion |
| session 2 (Thurs.) | group discussion 2 |
| | reporting 2 + class discussion |
| | class test |

   (How would you improve this model, if you differed slightly? **And** How would it effect your preparation?)

9. Which information had the most value for you?
10. Which information saved you the most time?
11. Would you have liked to have only the DVD without formal classes?
12. What is your opinion of the DVD as an ICT variant? What do you see as its advantages? And disadvantages?
13. Would you have wanted all the information on one DVD? Or are the four DVDs fine? Would you have wanted the four DVDs in advance or do you prefer the weekly distribution?
14. In your opinion, were the MODULE-outcomes attained?

# APPENDIX 4