

# **The integration of Digital Video Discs (DVDs) and multimedia in the Learning Area Social Sciences**

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## SUMMARY

*Key words: digital video disc (DVD), Geography, History, Humanities, Information and Communication Technology (ICT), multimedia instruction, multimedia, Social Sciences, teacher training, teaching and learning, teaching methods, technological literacy, technology education, technology, tertiary/higher education.*

The integration of ICT within the new Curriculum of the National Education Department of South Africa into Learning Areas is important for pre-service teacher training at university. The Learning Area Social Sciences (LASS) pre-service teachers are exposed to the integration of ICT and multimedia resources in teaching and learning. They can be trained to plan lessons that are more active and learner-centred and so slow the widening gap between South Africa and the developed world with respect to ICT integration and the use of multimedia resources in teaching and learning at schools. The interactive digital video disc (DVD) and portable DVD player is a cheap, accessible, and practical alternative that ensures the integration of ICT and a variety of multimedia resources, in teaching and learning within LASS. The purpose of this study within the LASS is to determine what type of multimedia resources can be used to the benefit of student learning; what the structure and format of the multimedia on the DVD should look like to achieve selected learning outcomes; and to determine how one can integrate ICT, specifically the DVD, into teaching and learning.

A quasi-experimental research design was used in this study. Four intact groups were exposed to different experimental treatments/interventions and the four groups acted as their own controls. The control group always consisted of two groups. The participants included the total population of bona fide, full-time, first-year students taking the compulsory module in LASS as part of the BEd Intermediated and Senior phase Programme at the North-West University (Potchefstroom Campus). They were exposed to class tests, a semester test and an examination as measuring instruments. The material developed for the intervention was two multimedia DVDs. The one contained predominantly text with audio (DVD 1) and the other contained still graphics, audio, text and video, etc. (DVD 2). Two DVDs were made for History and two for Geography, respectively, for each of the four interventions. The data was analysed by means of an ANCOVA. It compared the variances ( $s^2$ ) within and across the three groups (two separate experimental groups and two groups combined to form one control group), controlling for the covariate (ability measured by the pre-test).

The results of the study found that the type of multimedia resources used to the benefit of LASS student learning within the disciplines of History and Geography include multimedia such as visual and moving images and text with educational content. The nature of History and Geography themes are factors that need to be taken into consideration when deciding on the

structure and format of the multimedia on the DVD to ensure that student learning within the LASS achieves the selected learning outcomes. It was also found that ICT, specifically the DVD, and multimedia can be integrated successfully in the teaching and learning of the LASS. The study found that the integration of DVDs and multimedia in the LASS can be applied at tertiary level in a developing country without placing participants at a disadvantage.

## OPSOMMING

**Sleuteltermes:** *digitale videodisket (DVD), Geografie, Geskiedenis, Geesteswetenskappe, Inligtings- en Kommunikasietegnologie (IKT), multimedia-onderrig, multimedia, Sosiale Wetenskappe, onderwyseropleiding, onderrig en leer, onderrigmetodes, tegnologiese geletterdheid, tegnologie-onderrig, tegnologie, tersiêre/hoër onderrig.*

Die integrasie van IKT binne die nuwe Kurrikulum van die Nasionale Departement van Onderwys van Suid-Afrika, en ook binne die Leerareas is belangrik vir onderwysers wat voordiensopleiding op universiteit ontvang. Die onderwysers in opleiding binne die Leerarea Sosiale Wetenskappe (LASW) is aan IKT integrasie sowel as aan multimediatronne in onderrig en leer blootgestel. Hulle kan opgelei word om hul lesse meer aktief en leerdergesentreerd te beplan om sodoende die gaping tussen Suid-Afrika en die ontwikkelde wêreld te vernou wat betref IKT-integrasie en die gebruik van multimediatronne in onderrig en leer by skole. Die interaktiewe digitale videodisket (DVD) sowel as die draagbare DVD-speler is 'n goedkoop, toeganklike en praktiese alternatief wat die integrasie van IKT sowel as verskeie multimediatronne binne onderrig en leer in die LASW verseker. Die doel van hierdie studie is om vas te stel watter tipe multimediatronne in die LASW tot die voordeel van studente leer gebruik kan word; hoe die struktuur en formaat van die multimedia op die DVD moet lyk om geselekteerde leeruitkomstes te bereik; en om te bepaal hoe IKT – veral die DVD – in onderrig en leer geïntegreer kan word.

'n Kwasi-eksperimentele navorsingsontwerp is in hierdie studie gebruik. Vier nie-beïnvloedende groepe is aan verskillende eksperimentele intervensies blootgestel en elk van die vier groepe het as hul eie kontrole opgetree. Die kontrolegroep het te alle tye uit twee groepe bestaan. Die deelnemers het bestaan uit die volle aantal bona fide-, voltijdse, eerstejaarstudente wat die verpligte module LASW studeer. Hierdie module maak deel uit van die program vir die BEd Intermediêre en Senior Fase van die Noordwes-Universiteit (Potchefstroomkampus). Hulle is aan klastoets, 'n semestertoets en 'n eksamen as meetinstrumente blootgestel. Die materiaal wat vir die intervensie ontwerp is, was twee multimedia-DVD's. Die een het uit grotendeels teks gepaard met audio bestaan (DVD 1), en die ander het uit grafiese beelde, audio, teks, video, ensovoorts bestaan (DVD 2). Vir elk van die vier intervensies is twee DVD's gemaak, onderskeidelik vir Geskiedenis en Geografie. Die data-analise is gedoen deur middel van ANCOVA. Dit vergelyk die variante ( $s^2$ ) binne die drie groepe (twee afsonderlike eksperimentele groepe en twee gekombineerde groepe wat een kontrolegroep vorm) en kontroleer die kovariaat (kundigheid gemeet aan die voortoets).

Die resultate van die studie toon dat die tipe multimediabronne wat tot voordeel van LASW studenteleer binne die dissiplines van Geskiedenis en Geografie gebruik is, multimedia soos visuele en bewegende beelde en teks met opvoedkundige inhoud insluit. Die aard van Geskiedenis- en Geografietemas is faktore wat in ag geneem moet word wanneer daar op die struktuur en formaat van die multimedia op die DVD besluit word. Dit moet gedoen word om te verseker dat studenteleer binne die LASW die geselekteerde leeruitkomste bereik. Daar is gevind dat IKT, spesifiek dan ook die DVD, en multimedia suksesvol geïntegreer kan word in die onderrig en leer van die LASW. Die studie het tot die gevoltrekking gekom dat DVD- en multimedia-integrering in die LASW op tersiêre vlak in 'n ontwikkelende land toegepas kan word sonder om die deelnemers te benadeel.

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# **CHAPTER 1**

## **INTRODUCTION AND PROBLEM STATEMENT**

### **1.1 INTRODUCTION**

The dominant tendency during the twentieth century in South Africa's education curriculum was the mastering of a content-based curriculum (Du Toit & Du Toit, 2004:4). Since the turn of the century and with the inception of democracy in the Republic of South Africa (RSA), Outcomes Based Education (OBE) has been introduced into the education system whereby learning outcomes must be mastered for each learning area like Social Sciences as stipulated in the National Curriculum Statement (NCS) (Department of Education, 2002:1-2). Another addition to the curriculum has been the integration of Information and Communication Technology (ICT) into teaching and learning, at secondary and tertiary level, specifically within the learning areas (Department of Education, 2002:1; NWU, 2007a:1).

The purpose of this study is to discuss the integration of ICT into the new education system of the RSA with specific reference to pre-service teachers at tertiary level using a digital video disc (DVD) with a portable disc player in the Learning Area Social Sciences (LASS). Pittard, Bannister and Dunn (2003:3, 9) state that unspecified statistic data in the United Kingdom shows that both parents and children consider ICT to have a positive effect on learning and that ICT motivates students to learn. The DVD, designed for this study, contains multimedia resources (e.g., still photographs and video) that research claims to benefit student learning (Mayer, 2001:3-4; Lampert & Ball, 1998:43, 79). In order to achieve learning outcomes in the LASS attention will be given to the structure and format of the DVD as an ICT variant. The primary purpose of this study is to evaluate the influence of two different formats of presentation on DVD on student outcomes in the LASS. The DVDs contained text and multimedia and were used for first year pre-service teachers in the LASS.

### **1.2 CONTEXTUALISATION, PROBLEM STATEMENT AND RESEARCH QUESTIONS**

According to Gillespie (2006:104), ICT has the potential to facilitate changes in education, such as information retrieval and presentation that will prepare students well for the Information Society. What is needed in the Information Society is a shift from the 'traditional' teacher-dominant paradigm to a new paradigm where the emphasis is on active and interactive learning. The integration of ICT within the new Curriculum of the RSA is well suited for integrative learning as it not only helps to gather, synthesise and present information, but also

provides skills that are needed in the growing technology-based work place (Howie, Muller & Paterson, 2005: xiv, xvii, 3).

The National Education Department of the RSA emphasises the integration of ICT into OBE as a principle of the NCS in the Curriculum Statement (Howie *et al.*, 2005:3). The implementation of OBE as a principle of the NCS in South Africa brought about a paradigm shift from teacher-centred to learner-centred teaching, which is embedded in the constructivist theory (Smerdon & Burkam, 1999:2). This is, for example, where students actively construct their own knowledge through a characteristic group work session where learner-centred learning takes place. The White Paper on Education and Training (SA, 1995:15) states that the driving force behind the establishment of a new education policy for the RSA was to ensure that continuous learning takes place and that new knowledge, skills and technologies are adopted and developed so as to help address the challenges of the 21<sup>st</sup> century.

The establishment of the eight Learning Areas in the General Education and Training (GET) Band is one of the important outcomes of the new Curriculum for South African schools (Department of Education, 2002:2). The subjects History and Geography were two separate subjects prior to 1994 and since August 1996, the disciplines were combined and called Human and Social Sciences (Smit, 2000:168-169; Van Eeden, 1999:13-14). In 2002, the Department of Education presented its streamlined and strengthened version of Curriculum 2005, namely the Revised National Curriculum Statement (RNCS) (Bateleur Paneel, 2004:2-3). The NCS now states that History and Geography are linked, but must be taught separately, each with its own learning outcomes and assessment standards. The LASS, as it is now known, is a compulsory Learning Area in the Intermediate and Senior Phases (Department of Education, 2002:3).

The SITES<sup>1</sup> Module 1 study from 1998-1999 identified a lack of training regarding the integration of ICT into different Learning Areas. An evaluation of the status of ICT in schools in South Africa and internationally, was undertaken in relation to the teaching activities of teachers and/or students (Howie *et al.*, 2005:xviii). The finding of this study, amongst others, brings to the fore the importance of paying attention to integrating ICT into the LASS due to the lack of ICT integration at present.

It is important that, in the training of pre-service teachers at university, students are exposed to similar approaches in teaching and learning than is expected of them as teachers within the school system (Golightly, 2005:11). This means that where university students are exposed to

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<sup>1</sup> The Second Information Technology in Education Study (SITES) is an international comparative study managed under the care of the International Association for the Evaluation of Educational Achievement (IEA).

the integration of ICT in teaching and learning they are well equipped for teaching at schools where they can plan lessons that are more active and learner-centred with integrated ICT.

The use of ICT means that computer technologies, electronics and telecommunications are used to process and distribute information in digital and other forms (ANON, 2005). This would be, for example, a simple overhead projector acting as the information and communication technology, whilst the medium used to provide the information would be a transparency. Multimedia is in essence digital information in various forms that include text, numbers, images, video and audio (Shepherd, 1998:63), which allows information to be conveyed through flexible mediums that can be read, watched, heard or built into animation (Starr, 1996:1). The word media in multimedia, thus, refers to different kinds of information that are joined together in one product (Shepherd, 1998:63). Multimedia is, thus, the integration of diverse forms of information in a digital form, however, it was not in itself created primarily as a type of educational product. Microsoft, as quoted by Shepherd (1998:63), is one commercial organization that emphasizes the learning benefit of multimedia by stating that their Encarta multimedia encyclopaedia "... brings learning to life with words, images, animations, and sounds that work together to create a fascinating universe of knowledge... sparks curiosity, opens the door to wonder, and starts a learning experience that never ends... helps you find the joy of learning." Shepherd (1998:63) further remarks that multimedia is a "cut above other forms of information... I almost guarantee effective learning when used by students."

Research by Peterson (1994:27) shows that experienced teachers, who have used multimedia resources like animation, video, texts with chronologies and images, claim that the use of multimedia resources benefit students who do not excel in response to the traditional teaching strategy. The latter research also shows that multimedia benefits those who excel through independent investigation and those working in groups. At university, the lecturer assumes the role of facilitator enabling the student to develop an individual work pattern and learning method. According to O'Donoghue, Singh and Dorward (2001:518), multimedia technology is enhancing and supporting traditional lecturing, thus, changing the role of the lecturer from "knowledge presenter" to a facilitator who provides guidance and support. This approach can be used with pre-service teachers by integrating multimedia with an accessible technology. Prior research has reported that the use of computer-assisted instruction, specifically, interactive videodisc instruction, resulted in objectives being achieved at a higher level by the experimental group as opposed to the control group (Fitzpatrick, Duncan, Williamson & Smith, 1997).

The use of ICT in a developing country like South Africa could be problematic. According to the White Paper on e-Education (Department of Education, 2004b:7-8), the RSA has a lack of developed infrastructure for ICT that is widening the gap between South Africa and the

developed world. This is evident in the United States of America where 72.7% of Americans currently use the Internet compared to only 6.4% of South Africans who have access to and use the Internet.

A further setback to the above-mentioned hindrance is the slow rate of integration of ICT into teaching and learning at schools in the RSA. This integration is slower than the rate at which hardware and connections are made (Howie *et al.*, 2005:9). This means that a human factor such as human fear of, or lack of skills in ICT is responsible for the slow integration of ICT into teaching and learning. Teachers must, therefore, use other forms of ICT so that they are in step with modern technology and can use ICT as a resource and learning tool within the curriculum. Cheaper, more accessible and practical alternatives may include video-cassettes, video-recorders and televisions, but most importantly these alternatives have to ensure the integration of ICT in teaching and learning within as many Learning Areas and disciplines as possible. One such alternative is the interactive DVD.

Multimedia integration can take place by means of a portable DVD player. DVD technology is the most successful video technology of any new format in the history of electronics (Fitzpatrick, 2001:1-2). The use of multimedia resources is greater on DVD than is commonly used in the traditional lectures, for example, audio and video resources (pictures, audio speech, music, animations, video clips, group-based activities, electronic inter-activity, models, etc.) (Andresen, 1999:5). Multimedia is also an extremely popular technology utilised by American families and is reflected in the American statistics that shows a DVD-Video growth rate of 300% from 1999-2000 (Fitzpatrick, 2001:1-2).

The aforementioned in mind, DVD technology can become a contemporary form of ICT used in the RSA. The personal computer and television together with the DVD player can use a DVD, but the portable DVD player is cheaper, costing under R1 000, is portable and battery operated. Its discs cost R3 and its storage capacity of 4.7 GB is greater than that of a CD and videocassette. It also has exceptional image quality and can combine text, audio, photographs, animation and videos (Crawford, 1999:2; Anon, 2002:1; Steyn, 2005). Twenty-first century advances in technology, like the use of the DVD player may perhaps, lead to the steady use of this form of ICT integrated into teaching. It may be used as an additional learning resource consisting of a variety of multimedia resources with a specific format and structure useful for learning in Learning Areas like Social Sciences at university (White, 2003:148).

Research conducted by Bernhard (2007), however indicates that interactive technologies do not result in “automatic” good learning results. He maintains that when deciding to implement interactive technology into teaching and learning, one must remember that there is “no definite

answer to the common question if computers help to achieve 'better' learning". A study by Elen and Louw (2006), states that additional media can be non-effective in learning. They state that additional media aids may produce problems, instead of helping to achieve a goal, if used ineffectively by a learner. They say that well-designed media aids are not enough, but need to be used effectively by a knowledgeable learner.

On the contrary, according to Patel and Patel (2006:1), multimedia can be a helpful tool in enhancing the communication capabilities of teachers in the educational system. They state further that the correct communication media, used effectively, can be a useful tool for teaching students in India in a more effective way. Therefore, one can say that universities need to offer comprehensive programmes of ICT in education and that they should integrate sound educational ICT and multimedia into the teaching and learning practices of pre-service teachers so as to ensure effective teaching and learning aided by ICT and multimedia. Hence, the BEd Programme at the North-West University (NWU) used the DVD with a specific format and structure as well as the DVD player and integrated the latter into the teaching and learning of the LASS. The purpose of the study was to establish the effect of different multimedia formats and structures on student learning and outcomes in the LASS. The latter is hoped to help bridge the divide between the integration of ICT and multimedia resources into education.

The DVD, with its benefits mentioned above, together with multimedia resources can be integrated into pedagogical practices to ultimately ensure optimum results in learning (Mayer, 2002:55-56). Mayer (2002:64) states that university students learn more in depth from multimedia presentations in which animation and narration are presented simultaneously rather than successively. One can, thus, change the structure of the DVD and its format where varying combinations of multimedia are used on the DVD to establish which combination is best suited for and preferred by the LASS students. One can, for example, use only text on the screen, or alternatively, visuals with audio explanations. Mayer and Moreno (2002:87) state that multimedia instructional environments are widely recognised to hold great potential for improving the way that people learn as they are exposed to different forms of presentation such as dynamic animated material.

The integration of ICT into a Learning Area like the LASS must be used as the foundation for a mind shift that must be made at university. The mind shift involves the integration of ICT not only to learn a specific skill, but also rather to integrate multimedia resources into the teaching and learning of pre-service teachers who can then apply their experience to teaching at schools. One can then try to establish how different formats affect student learning both positively and negatively. Multimedia technology may prove useful in the LASS because Geography is regarded as a highly visual subject that may be well complimented with the use of multimedia

resources (Peterson, 1994:27). This is supported by McKendrick and Bowden's (1999:9) research showing that audio-visual resources can be used effectively to support teaching and learning in Geography at university because visual presentations and representation are integral parts of Geography education (e.g., imported digital images, Power Point presentations, satellite imagery via the World Wide Web, etc.). In History teaching many resources are listed as excellent resources of media (e.g., video recordings from television, electronic journals with multimedia, CD-ROM software, etc.), which can be used to support History teaching and learning successfully (Weiner, 1995:10; Van Eeden, 1999:213-216; 235-236).

The problem, thus, faced in a developing country like the RSA is the integration of ICT into teaching and learning using cost effective alternatives. When deciding on the use of the DVD as an alternative, it was decided how best to structure and format the DVD so as to achieve specified learning outcomes at university integrating ICT in teaching and learning within the LASS. The challenge then was to create the best combination of multimedia resources within the structure and format of the DVD that would be both beneficial to History and Geography to promote learner-centred learning in the LASS. This research study was based on the cognitive theory of multimedia learning based on assumptions about how people learn when exposed to verbal and pictorial forms, so as to establish whether students learn better with one medium compared with another (Mayer, 2002:55; Mayer & Moreno, 2002:87). The purpose of this study is to address the following research questions:

- What type of multimedia resources can be used to the benefit of student learning within the LASS?
- What should the structure and format of the multimedia on the DVD look like to achieve selected learning outcomes within the LASS?
- How can one integrate ICT, specifically the DVD, into the teaching and learning of the LASS?

### **1.3 RESEARCH AIMS**

The aims of this study are to determine:

- What type of multimedia resources can be used to the benefit of student learning within the LASS.
- What the structure and format of the multimedia on the DVD should look like to achieve selected learning outcomes within the LASS.
- How one can integrate ICT, specifically the DVD, into the teaching and learning of the LASS.

## **1.4 CENTRAL THEORETICAL STATEMENT**

The integration of ICT, specifically the DVD, using different multimedia in teaching and learning can be beneficial to LASS students at tertiary level.

## **1.5 METHOD OF RESEARCH**

The procedure that was followed involved a quasi-experimental design. All respondents were subjected to several assessments, where the respondents received different study material for two study themes in History and Geography respectively. A literature study was undertaken in the field of ICT and multimedia integration in teaching and learning. The literature study also focused on the outcomes of the research at secondary and tertiary level. Consent for participation from the head of the Learning Area department was obtained in order to get permission to use the students of the first-year compulsory module LASS, who were part of the BEd Programme at the NWU. It was decided that the four groups that would make up the module group LASS during the six-month period, would alternate twice, acting as the experimental group and control group. Each student would receive two DVDs, one for Geography and one for History, together with one portable DVD player when part of the experimental group. The two DVDs that each student received would contain different multimedia. One contained predominantly text with audio and the other contained still graphics, audio, text and video. Students who formed part of the control group received a traditional contact lecture. The first phase of the experiment was to collect and analyse data from class tests. The second phase of the experiment was to collect and analyse data from the semester test and examination. The interpretation of results comprised of a data analysis using an ANOVA for the pre-test to compare the averages of the four groups. An adjustment for the pre-test (ability) results was done using the ANCOVA as the statistical procedure. Statistical significance (p-values) as well as practical significance (effect sizes) is reported. Final recommendations for the best variations of multimedia for the LASS are made.

## **1.6 CHAPTER DIVISION**

Chapter 2 includes a literature review of the integration of multimedia in teaching and learning and focuses on the cognitive theories, especially Mayer's cognitive theory, related to multimedia learning.

Chapter 3 focuses on a discussion of the integration of ICT and multimedia in teaching and learning in the LASS. The factors and principles necessary for the design of multimedia are also discussed.

Chapter 4 focuses on the method of research used in this study.

Chapter 5 contains the results and a discussion thereof.

In chapter 6 the conclusion and recommendations for future research are presented.

## **CHAPTER 2**

### **THEORETICAL FRAMEWORK OF STUDY**

#### **2.1 INTRODUCTION**

As referred to in Chapter 1, multimedia has been used with great success in secondary and tertiary institutions. This chapter focuses on a literature review of the cognitive theories that relate to the processing and storage of information as well as how these theories relate to multimedia learning. Remarks made by Lampert and Ball (1998:109) stating that: "The multimedia environment offers significant potential as a site for a new pedagogy of teacher education" must be taken into account so as to establish if the inclusion of multimedia is significant to student learning. The advent of multimedia has seen the birth of a tool aided by technological hardware that helps teachers to simplify and improve explanations for a new learning community who use multimedia to learn. The purpose of this chapter is, therefore, to determine through a literary study, what theories are relevant to multimedia learning and so help one understand how students think and learn. The literature review focuses on cognitive learning theories, information processing, constructivism and Mayer's cognitive theory related to multimedia learning.

#### **2.2 COGNITIVE THEORIES OF LEARNING**

According to Spangenberg (1994:265), cognition involves our thoughts, ideas, convictions, understanding and knowledge. Learning is defined as a continuing change in behaviour that results from practice or experience (Schunk, 2004:2). The cognitive theories of learning focus on changes that take place in the cognition of a subject, during the learning process. Therefore, cognitive learning deals with obtaining knowledge and understanding. The aim with the investigation of cognitive learning theories is to understand internal mental processes that transform information taken in through the senses and then codes, stores, and later retrieves the stored information from memory (Sternberg, 2006:160-161).

In order to design multimedia instructional material for teaching and learning, one must fully understand how the human mind works when learning (Mayer, 2003:137). According to Wellington (2006:3), teachers and students should understand how the right and left sides of the brain work in a learning situation. He states that each side should be active and 'linked' and that visual, auditory and kinaesthetic input can enhance this. Starr (1996:2) agrees and states that with multimedia one draws on "more of the senses and more dimensions of intelligence." Shepherd (1998:53) warns that multimedia with its fascinating technical abilities and effects can

become a distraction from learning. Despite this, Wellington (2006:4) states that seeing that learning involves all parts of the brain, including emotions, learning material could be more enjoyable and longer lasting when the environment created for learning is enjoyable and the learner is confident and comfortable. Thus, he states that positive emotions can encourage effective learning as emotion is closely connected with cognition- being knowledge and understanding. It forms part of the affective domain where objectives focus on attitudes and feelings.

The cognitive view holds that knowledge is learned, and changes in knowledge make changes in behaviour possible. This view sees people as: active learners who introduce experiences; acquire information so as to solve problems; and reorganise what they already know so as to achieve new insights. Things around them do not passively influence people, but they choose to pay attention, ignore, reflect and make decisions as they pursue goals (Woolfolk, 1998:247).

Cognitive learning theorists also believe that people's beliefs, expectations and feelings influence what and how they learn (Woolfolk, 1998:247). Cognitive theorists regard knowledge as the outcome of learning and the power of knowledge is viewed as the driving force in learning. People plan their responses, use systems to help them remember and organise learning material in unique ways. Therefore, interest in the field of learning and memory has lead to many theorists formulating several cognitive theories of learning that view learning as an active mental process of acquiring, remembering and using knowledge (Woolfolk, 1998:246-247). Cognitive theories of learning are based on the idea that learning occurs when learners actively piece together an understandable representation through a limited capacity of short-term memory (Moreno, 2004:101). Cognitive theories of teaching emphasise that the presentation of material is important so that learners can organise, relate and remember the newly acquired material meaningfully (Schunk, 2004:13).

Louw, Louw and Schoeman (1994:493) discuss how cognitive processes such as thought, memory and intelligence play an important part in determining an individual's behaviour. Piaget's theory and information-processing are two important approaches in this regard. According to Sutherland (1992:8;86), Piaget maintained that children pass through a series of stages of thinking, characteristically different from each other. He maintains that cognitive development is determined by a complex interaction of genetic, psychological and environmental factors, thus, dividing human cognitive development into four periods according to age and stage of development (Louw *et al.*, 1994:494). Many contemporaries do not accept his concept of different ways of thinking and so the information-processing scholars differ in that they focus on one act of learning taking place at a given time (Sutherland, 1992:8;86). Louw *et al.*, (1994:494) state further that the followers of the school of information-processing try to

determine the ways in which people process information from the moment that perception takes place until it is used. The human being is regarded as a system through which information flows and memory, intelligence, attention, perception and problem-solving are key points of interest studied in the human.

Cognitive learning theories involve explaining how the brain processes and stores new information so as to answer questions related to cognition (SIL International, 1999). Therefore, information-processing is discussed further as it describes how people's mental processes function with respect to encoding, storing and retrieving information (Sternberg, 2006:495).

### **2.2.1 Information-processing**

Information-processing does not refer to one theory. It refers to a general name applied to theoretical points of view that deal with cognitive events (Schunk, 2004:136). Information-processing focuses on how students learn (acquire knowledge), relate it to knowledge in memory, store new knowledge in memory, and remember (retrieve knowledge) so as to make decisions, answer questions and process information. In essence, it studies the human mind's activity of taking in, storing, and using information. The actual process of cognition uses short-term memory to do so (Sutherland, 1992:86). Atkinson and Shiffrin (1968) (quoted by Shuttleworth-Jordan, 1994:286) and Gagné (1985) (quoted by Woolfolk, 1998:250) are three theorists whose preceding ideas date from the 1960s and 1970s and have been used as a basis for further research as described below.

Information-processing is regarded by Sutherland (1992:86-87) as focusing on the single act of learning taking place at a particular time. It is also concerned with the process of learning rather than with the nature of the learner. Some researchers of information-processing maintain that to be knowledgeable one must be able to process information efficiently, while others believe that speed and accuracy of information-processing are important factors in intelligence (Sutherland, 1992:86-87; Sternberg, 2006:495). This means that one must be able to: visualise a problem spatially with all its details; be able to understand a new visual field quickly; be able to formulate a conclusion after being presented with evidence; show verbal comprehension; store visual material in the brain; and be able to work with numbers. It, therefore, stresses competence in the learning processes. However, Schunk (2004:13) states that how information is learned, determines how it is stored in and retrieved from memory, therefore, making memory critical for learning.

According to Sutherland (1992:86), a large capacity to memorize is one of the most important factors in successful information-processing, whilst Schunk (2004:19,137) states that memory

lies central to information processing and also compares the human mind to the computer. Mayer (1996:154) and Shuttleworth-Jordan (1994:286) elaborate on the analogy with technological software and hardware in that humans take information as input, apply mental changes to the work and produce information as output, therefore, describing how information processing consists of three parts. The nature of information-processing is, therefore, multifaceted in that, humans are processors of information, the human mind is a system that processes information, cognition is a series of mental processes and learning is the acquisition of mental representations (Schunk, 2004:136).

Relating the above theory to education one can say that information processing regards the teacher as the supplier of information whilst the student receives information, from textbooks and lectures (Mayer, 1996:152-153). Information-processors regard learning in terms of an individual who is goal directed, pays attention to the nature of the learning processes and in so doing develops a skilful behaviour pattern (Sutherland, 1992:90). Information processing came about in reaction to the behaviourist theories. Behaviourist theories, as described by Sutherland (1992:90), state that most behaviourists' regard learning as a process whereby learners respond, with limitations, to teachers. The latter, is reinforced by Schunk (2004:137), who states that behaviourist theorists believe that all learning involves forming an association between a stimulus and a response. Woolfolk (1998:247) also states that behaviourists believe that reinforcement improves responses. He also maintains that both behavioural and cognitive theories of learning highlight reinforcement as being important in learning. However, information-processing is more concerned with mental processes (how the mind works) taking place than the external processes which concerns the behaviourists (Schunk, 2004:137).

Three models of information processing of learning and memory are discussed below, namely the multistore model, levels-of-processing model and connectionist model.

#### **2.2.1.1 Multistore model**

The multistore model of information processing describes three memory-storage areas in the brain. Information received is viewed as being processed and stored in sensory memory (storage), short-term memory and long-term memory. The model is, thus, concerned with how information is processed and stored in memory in a successive manner. It also focuses on valuable strategies, namely rehearsal and elaboration used to help recall information (Woolfolk, 1998:250; Shuttleworth-Jordan, 1994:286; Schunk, 2004:138). The latter is illustrated in Figure 2.1 below.

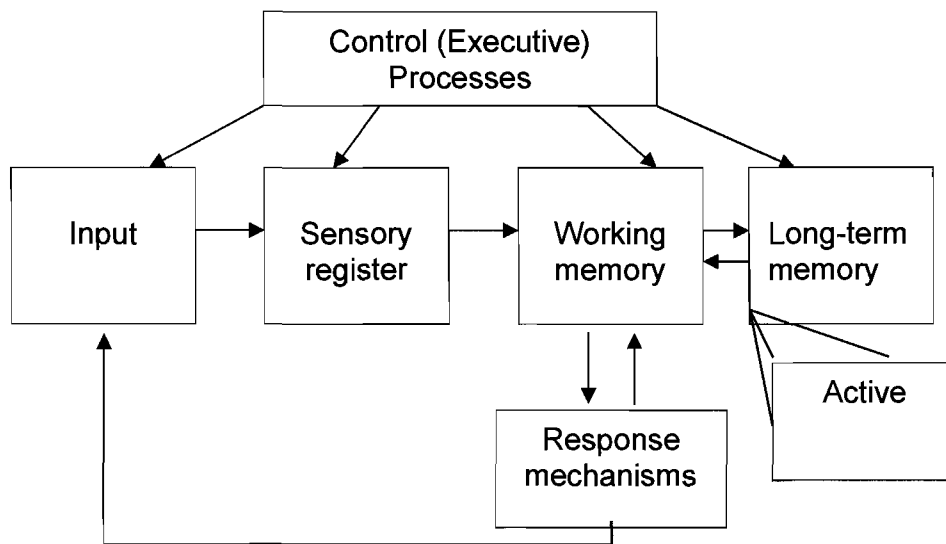


**Figure 2.1 A multistore model of information processing (Schunk, 2004:138)**

The illustration shows how information is stored (encoded) in the sensory memory where attention is required to ensure it is taken up in the short-term memory for further use. Thoroughly processed information becomes part of long-term memory through rehearsal and can be activated at any time to return to short-term memory (Woolfolk, 1998:250).

As mentioned above, memory is dependent on three systems of storage with the first being sensory memory that enters the sensory register through the senses. This means that any of the five senses may be involved after stimulation has stopped. The memories are of short duration lasting only one second in the case of visual sensory stimuli that go into the visual store. Memories may last as long as four seconds in the case of auditory sensory stimuli that go into the auditory store. This short time span is enough to blend successive images and auditory information so that one can see a coherent picture and hear so as to understand what is said in words and phrases and not in separate sounds. Not all information can be processed and so one becomes selective. Thus, attention lies central to this stage as focussing on information with the intent of remembering it requires attention. If this information is attended to, it moves into the next storage box, namely short-term memory to be processed further. However, if no attention is paid the information fades away and disappears (Woolfolk, 1998:251-252; Shuttleworth-Jordan, 1994:291; Schunk, 2004:138).

It is important to transfer information to the short-term (working) memory quickly or else the information stored in the sensory memory may fade away fast (Woolfolk, 1998:251-252; Shuttleworth-Jordan, 1994:291). It is important to note that perception is also very critical at this stage. This is because the learner has to interpret the information received via the senses,

based on an objective reality and existing knowledge. Thus, the meaning of what is seen or heard may change in keeping with what the learner recognises (Woolfolk, 1998:251-252;258). Perception is based on recognising familiar elements and arranging them into recognisable patterns (bottom-up process) and using previous knowledge to fill-in incomplete patterns (top-down processing). Images are representations based on perceptions and when humans form images, they try to remember or recreate physical characteristics and three-dimensional structures of information. In the past century, physicists such as Faraday and Einstein, spoke of how images are helpful in abstract reasoning. Images are helpful as they help to reason about complex new problems. It is important to remember, for presentation purposes, that people understand information received as organised and meaningful wholes. This is called the Gestalt theory, which means that learners tend to organise sensory information into patterns or relationships (Woolfolk, 1998:251-252;258). It is, therefore, important that when teaching takes place one takes care to ensure that the lecture's outcomes are clear, organised and placed within a meaningful context.

According to Sternberg (2006:195,196), short-term memory is a temporary storage place. Encoding in short-term memory is primarily audio. Shuttleworth-Jordan (1994:292) agrees by stating that verbal representations are more important than visual representations when encoding information into the short-term memory. For example, if one is trying to keep a sequence of five letters actively in the mind and verbal rehearsal (repetition) is not undertaken, then three of the five letters, fades within 20 seconds (Shuttleworth-Jordan, 1994:292). Visual encoding of information is encoded less frequently and at a slow rate of about 1.5 seconds. Such encoding is more likely to decay than audio encoding. In order to move information into long-term memory, one must take part in elaborative rehearsal. This means that one is trying to connect information more meaningfully to what one already knows. This is done so that information can become more memorable and organized, so as to ensure its transfer. Maintenance rehearsal is simple repetition of information. This type of rehearsal only holds information in short-term memory without transferring it to long-term memory due to its lack of organization. Information can also be 'chunked'. This means that related pieces of information are grouped into a single meaningful unit. The more effectively material becomes rehearsed and chunked, the greater the chance it is transferred to long-term memory (Woolfolk, 1998:256; Sternberg, 2006:198,199).

According to Woolfolk (1998:254-264), short-term memory has a very fast input ability of text, images and ideas. Immediate retrieval and limited capacity to store information are characteristic of short-term memory as it holds only five to nine bits of information at a time for up to 30 seconds. Short-term memory is, thus, not permanent. If material is not attended to quickly, the material fades away over time.

Despite long-term memory having a relatively low encoding ability, it has an infinite capacity of storing images, schemata's, prepositional networks, information, etc. with great accuracy. It is, however, possible that information can be encoded into long-term memory automatically, without conscious effort being made to remember the information. New material becomes more meaningful as it is connected to familiar things. It is effective as it integrates new information with previous knowledge, in an organised manner, in long-term memory. Retrieval of long-term memory is greater than in short-term memory, but it depends on its representation and organisation (Woolfolk, 1998:254-264; Shuttlesworth-Jordan, 1994:295-296). Sternberg (2006:196) states that the majority of information stored in long-term memory is encoded through words (semantically), however, research has revealed that visual and audio information is also encoded into long-term memory.

Schunk (2004:158) explains how long-term memory is unlimited in capacity and storage time. Three types of long-term memory exist, namely episodic, semantic and procedural. Episodic memories are classified as memories of events that have happened to us personally, for example, our first day at school. According to Schunk (2004:158) and Shuttlesworth-Jordan (1994:298-300), semantic memory concerns language and the world around us. This means that retrieval of information is meaningfully organised, as memories are stored as nodes interconnected with links. For example, when one refers to "a canary is yellow", the information is quicker to access from memory than "a canary is a bird" since the latter information is not stored with the node canary, but is linked with yellow. Procedural memory helps recall procedures for performing a skill (Schunk, 2004:158). Shuttlesworth-Jordan (1994:297) states that procedural memory contains memories of how to perform particular tasks or skills. This means that the procedural type of learning takes place by doing the activity. For example, playing a game of chess. Even if some time has lapsed, one is still able to retrieve the skills to the same level required quickly, with a little practice.

#### **2.2.1.2 Levels-of-processing model**

According to Sternberg (2006:167), the levels-of-processing model focuses on the depth of encoding as being deep or shallow. It proposes that there is an unlimited number of levels-of-processing at which information can be encoded. This model stresses that processing is the key to storage. It further maintains that the level at which information is stored depends on how it is encoded. The deeper the level of processing, the higher its likelihood of being retrieved. For example, research undertaken in Russia revealed that words that were logically connected (e.g., dog and animals) were recalled more easily than those not concretely connected (e.g., dog and leg). Woolfolk (1998:262) adds to this by stating that in order to establish how long

information is remembered one must determine how thoroughly the information is analysed and connected with other information. If processing occurs superficially, it means that information is not given full attention and is analysed poorly. The chances are then high that information analysed will soon be forgotten.

Sternberg (2006:167,168) states that many researchers, including himself, have found that a stimulus to recall exists, namely the self-reference effect. This research showed that the highest levels of recall occurred with words that people considered self-descriptive. This effect is attributed to the fact that people encode information to a greater extent when it is related to themselves than when the information is about other topics. Researches state further that when people initiate their own prompts, they show higher levels of recall than when given prompts by others. According to Sternberg (2006:169), research has found that the sequence of the levels of encoding are not as important as the type of elaboration of encoding and the type of task required for retrieval of information. However, he describes two strategies that exist for encoding. Within-item elaboration explains encoding of a particular item in terms of its characteristics (e.g., a word or fact). The second strategy is between-item elaboration. It explains encoding by relating each item's features to the features of items already in memory. Both strategies take place at various levels of processing.

### **2.2.1.3 Connectionist model**

According to Schunk (2004:173) and Woolfolk (1998:266), the connectionist model of processing information views knowledge as being stored in patterns of connections and so focuses on the interconnectivity of information in the complex network of the brain. Schunk (2004:173) explains that learning takes place when impulses from the brain move across the gaps between the nerve endings and form connections. It is also believed that higher order cognitive processes are formed by connecting large numbers of basic elements. Sternberg (2006:177) states that the spreading of the connection between the nodes may continue as long as the activation does not exceed the limits of short-term memory. Sternberg (2006:178) also states that short-term memory is made up of the activated portion of long-term memory and works through some amount of parallel processing.

Another characteristic of this model is its explanation of why humans can manage many operations at once. This is said to be due to the parallel activation of multiple links among nodes within the network and so it is believed that isolated memory does not exist due to the connected nature of stored memory (Sternberg, 2006:178). Schunk (2006:173) and Sternberg (2004:178) also state that the connectionist model involves the activation of memory and effectively explains procedural memory, which is knowledge that is held in the long-term

memory store of unconscious procedures. As an advantage, connectionist models explain the slowly developing and ever-changing nature of human learning, but it serves mainly to remind teachers that learning involves the continued building, expansion and adjustment of knowledge (Woolfolk, 1998:266).

#### **2.2.1.4 An evaluation of Information-processing**

Researchers of information processing agree that information processing involves cognitive processes, these having been influenced by advances in communications and computer technology (Schunk, 2004:188). They also agree that information processing occurs in stages. A short evaluation of the three models reveals some of their advantages and disadvantages as models of information-processing.

The multistore model of information processing has revealed that when learning, people recall the first and last items learned best. This is because the multistore model of information processing maintains that the first items learned receive the most rehearsal and is, therefore, transferred to the long-term memory, whereas the last items learned are still in short-term memory at the time of recall. Middle items are no longer in short-term memory, have received fewer rehearsals, and so are poorly stored in the long-term memory. This is disadvantageous when trying to recall middle information that has been subject to less rehearsal.

A weakness with this model is that it does not fully specify how information moves from one store of memory to the other, for example why do some inputs move from the sensory registers directly into the short-term memory and others not (Schunk, 2004:139,140). Another point mentioned by Schunk (2004:139) and Shuttleworth-Jordan (1994:292) is that this model seems to be suited for encoding audio material in short-term memory. Sternberg (2006:196) mentions that a majority of information is encoded through words and stored into long-term memory making it a model suited for handling audio material into short-term and long-term memory. This then questions how non-verbal representations like images are processed with material that may not be verbalised. It may, therefore, have a negative effect on how students learn, especially when they learn using text, audio, visuals and other sources of multimedia. A critical question asked about this model is whether automatic processing may not require the use of short-term memory because we do many things automatically like answering arithmetic calculations without much thinking. Therefore, in agreement with Schunk (2004:139,140), in future we must assess how automatic processing takes place, as it may affect short-term memory.

A strength of the levels-of-processing model, according to Sternberg (2006:169), is that the strategy of encoding information can be successful through the between-item elaboration strategy. It explains encoding by relating each item's features to the features of items already in memory, which makes sense as a connection is made and the information is stored successfully. Research by Sternberg (2006:169), reveals that when encoding takes place by means of rehearsal based on audio properties of words, retrieval was greatest based on the audio properties rather than on semantic properties of words. Similarly, greater semantic retrieval was achieved than audio retrieval when encoding was based on semantic encoding of words. This model may, therefore, support the suggestion, referring to the latter, that students who learn through a specific medium, such as multimedia with visuals may achieve better results when being assessed using visuals.

Criticism against the connectionist model is that it has failed to provide clear predictions and explanations of recall and recognition of memory that occurs following exposure to semantic information (Sternberg, 2006:178). This may affect the learning of students exposed to learning material that just consists of text or visuals. The problem with the connectionist approach, as discussed by Schunk (2004:174), is the concern of explaining how the mind knows which of the many units in memory to activate and how these multiple activations become linked in integrated sequences. This is easy to explain when it comes to deep-rooted patterns where, for example, neurons know how to react to a red robot, but the concern is that activation may be problematic in less-established patterns. The latter is important to know as it helps to explain the connections in learning and memory. According to Schunk (2004:174), this model has become more useful in explaining perception rather than learning and problem solving.

Reflecting on the information-processing models one must be weary that when dealing with education one can give students the opportunity to explain information and link it to existing information making it easier to recall. Teaching methods can also be changed to cater for individuals' cognitive styles, incorporating ICT. Therefore, learners can acquire cognition of mental processes that involves transforming, coding, storing and retrieving information as discussed above. Learners must, however, know which mental process to use and when, how and why it should be used, which calls for metacognition (Schunk, 2004:192).

Metacognition means one acquires knowledge about one's own thinking process and about the factors that influence one's thinking (Woolfolk, 1998:267; Wellington, 2006:3). This means that by thinking about how one thinks, and reflecting on how one learns the process of learning can be improved. It refers to our ability to monitor, control and organise our own mental activities. There is a strong belief that, if learners learn how to study/learn there will be a dramatic improvement in achievement. It is, thus, thought that if learners know which strategies are and

are not effective for their own learning, they will be able to use those, which are to their benefit (Woolfolk, 1998:267; Wellington, 2006:3; Schunk, 192,193). Sternberg (2006:224) refers to self-monitoring and self-regulating processes to help with the processing of all the information we receive and cannot encode, store, etc. to the same depth. Self-monitoring is a metacognitive activity that monitors how well one understands and remembers whilst self-regulating involves planning, directing and evaluating one's cognitive process. According to Sutherland (1992:94-95), learners need to be consciously aware of their own learning so as to improve the quality of their learning. They must also reflect on how and why they learn. Sternberg (2006:224) agrees and states that metacognition plays an important role in regulating and monitoring cognitive processes. One must remember that a wide variety of factors and conditions influence the process of learning, for example, the learner's style or preferred way of learning (Lambert & Balderstone, 2000:174). Woolfolk (1998:267) uses the computer as a good comparison to metacognitive processes, which can be useful for the integration of metacognitive processes into ICT learning. The learner decides what procedure is required from the menu on the monitor and selects a procedure from several choices. The effect of the choice is monitored and the learner can return to the menu if the results are unsatisfactory and so the learner plans, monitors and evaluates to regulate his/her thinking and learning. Thus, it is said that teachers can no longer view ICT and multimedia technologies as separate units in their teaching, but it is thought that using ICT in a constructive way in conjunction with teaching and learning can help to develop a fulfilling and useful curriculum.

According to Sutherland (1992:166), the above is true for Geography teaching and elaborates on how the information processing model and constructivism (cf. 2.2.2 below) are relevant approaches to Geography teaching. Information processing gives insight into how learners learn the quantitative and factual aspects of Geography. Constructivism uses the geographical concepts learners have acquired from reading books and empirical experiences gained on holiday, for example, as well as with the help of ICT in the form of visual multimedia. Information processing is also essential to History. The building up of facts through the life of adolescents should be able to maximize the learner's ability to store and retrieve historical facts (Sutherland, 1992:166). Metacognition is also an approach relevant to History teaching. This lends itself to resource-based learning as learners first need to learn how to obtain factual material from documents and then they need to learn how to use the factual knowledge retrieved to answer the questions. This then refers to the fact that the learner needs to be conscious of the learning process, guided by the teachers and be made aware of his/her skills of interpretation, analysis, referencing and reading with understanding (Sutherland, 1992:168).

### **2.2.2 Constructivist theory**

During the last two decades of the last millennium, the information processing theory discussed above has influenced the research of constructivism. Mayer (1996:154-159) states that the paradigm shift in psychology that helped the transition to the constructivist metaphor occurred when psychologists and teachers began to see learners as information processors and not as objects of response, leading to research on the constructivist views of learning. Knowledge is regarded as being subjective, personal and a product of one's cognitions, therefore, an individual's working hypothesis as described by Schunk (2004:287).

Constructivists believe that all people learn mostly through the framework of what they already know and as active participants in the process of learning. New information is understood only if it can be interpreted through existing knowledge structures. Thus, it is important to get learners to access their existing knowledge or to provide concrete experiences that will serve as the framework for their understanding of a topic or issue. Constructivist learning, therefore, involves social processes, self-reflection and interaction with the environment. As learners interact with their environment, they link information already learned and so construct new understanding and knowledge. It is important to note, thus, that in the constructivist theory, learning is supported by social interaction with peers and adults (Woolfolk, 1998:277; Schunk, 2004:287).

According to the learning theory of constructivism, a learner constructs his/her own knowledge actively (Brooks, 1990:68), based on what he/she understands from his/her prior experience, knowledge and interests (Wellington, 2006:134). The constructivist theory maintains that prior knowledge is of primary importance. A learner creates new links to his/her pre-existing knowledge, so as to learn meaningfully (Wellington, 2006:134). Over a decade ago, George Hein proposed some principles that emerged from the constructivist thought. He stated that learning is regarded as an active process whereby a learner uses his/her senses (especially sight, sound and touch) to help construct meaning (Wellington, 2006:134-135).

Many forms of constructivism exist. Two forms exist that share a focus on individuals constructing their own learning. They are psychological constructivism, which emphasises the individual, and the other is social constructivism, which emphasises the social context (Schunk, 2004:286). According to Schunk (2004:286), psychological or individual constructivism is concerned with the individual learner and how the learner constructs knowledge, beliefs and identity during the learning process. Piaget's theory of cognitive development forms the basis for psychological constructivism (Schunk, 2004:447). This is so because Piaget's theory emphasises cognitive development of a learner's progression through a series of stages

(Schunk, 2004:448). The role of the individual learner remains the focus in the construction of the learning environment (Schunk, 2004:327).

Social constructivism, on the other hand, points to the fact that communication, social interaction and instruction is crucial in scaffolding thinking and cognitive development so as to acquire skills and knowledge (Wellington, 2006:134-135; Schunk, 2004:208). Schunk (2004:327) states that the social constructivist approach emphasises that social interaction shapes cognitive development and is essential to learning. The social constructivist approach is based heavily on Vygotsky's sociocultural theory that social processes are important to learning and does not agree with the psychological constructivist approach with respect to knowledge lying within the individual (Schunk, 2004:291).

According to Schunk (2004:287), constructivism has influenced educational thinking. It emphasises that an integrated curriculum should be used, so that students can learn from multiple perspectives such as reading about the topic, drawing pictures and investigating. This will enable students to get hands-on experience, etc. and so apply learner-centred principles to the design of the curriculum (Schunk, 2004:287). Woolfolk (1998:495) states that characteristic learner-centred approaches of constructivist teaching used in teaching, show that the learner must: be an autonomous, intuitive and active participant in the learning process; be self-regulated; interact socially; and make sense of information for him/herself. Woolfolk (1998:495) discusses approaches of constructivist teaching that are characteristically used by the teacher. They include: the use of raw data and manipulative material; the use of cognitive terminology such as analyze and classify; allow learner responses to lead the lesson; encourage learner inquiry by posing open-ended questions; encourage discussion; allow wait-time after posing questions; and allowing time for learners to discover relationships on their own.

Jackson (2000:162) discusses constructive learning as active, outcome-oriented and self-regulated learning, where meanings are discussed, more than one perspective is encouraged and learners work their way through information and knowledge. He also states that constructive learning has become the focus of contemporary educational philosophy and that teaching styles need to match the new "method" of learning. Jackson (2000:164) states how the pressure has been increased more recently on moving away from the traditional sense of delivering instruction to constructive methods of teaching due to the increased use of ICT to obtain and process information so as to ensure learning. The inclusion of ICT leads to an interactive style of teaching. It includes periods of student participation in presenting and/or discussing information. This is done through group work and brainstorming once information has been accessed (Agnew & Elton, 1998:2). Jackson (2000:163) comments further that, new technologies do not only help learners find more information but they help develop new skills

associated with deep level processing and meaningful learning like problem solving, critical thinking and metacognition, as discussed above.

### **2.2.2.1 An evaluation of the constructivist theory**

According to Schunk (2004:291), one must evaluate the constructivist theory. One can look at the process of how students construct knowledge and what factors, for example, social, developmental, and instructional, can do this. One must ensure that society's norms do not threaten this learning theory because this theory accepts all forms of knowledge just because learners construct them. One must remember that there are values and responsibilities instilled into education (Schunk, 2004:291). Constructivist learning ensures less superficial learning, more emphasis on deeper understanding by providing rich experiences that encourage students to learn and is, therefore, beneficial as a learning theory (Schunk, 2004:328). One can say that when discussing cognitive learning theories, like the constructivist theory, students do "construct their own knowledge".

### **2.2.3 Cognitive theory of multimedia learning**

Mayer and Moreno have, over the last 12 years been at the fore of understanding the nature of multimedia learning and so aimed to contribute to the cognitive theory of multimedia learning which is a cognitive theory of how people construct knowledge from words and pictures (Mayer & Moreno, 2003:50).

Mayer (2003:136) describes how the cognitive theory of multimedia learning assumes that the human mind is a two-channel system of information processing. It has visual/pictorial and verbal/auditory processing channels. Each is limited in capacity regardless of whether what is presented is on paper or on a digital screen. Once the human mind receives information for cognitive processing, it selects, organises and integrates the mental representations promoting meaningful learning. The core significance of meaningful learning is to find out what the learner already knows and teach him/her accordingly. This implies that meaningful learning can only be meaningful if it builds on and is linked to what the learner already knows (i.e., prior knowledge) otherwise it becomes meaningless rote learning (Wellington, 2006:144). Woolfolk (1998:341) confirms this by stating that it is proposed by researchers that meaningful verbal learning is also connected to existing knowledge. Mayer (2003:137) believes that it is the cognitive processing by the learners that causes learning and not the media environment that causes learning. What is, however, required for multimedia learning is that learners must be able to hold corresponding visual and verbal representations in short-term memory at the same time. Mayer (2002:60) states that a successful learning experience involves students who: meaningfully interact with

academic material; select relevant verbal and non-verbal information; organise information into corresponding mental models; and integrate new representations with existing knowledge. Hence, it is assumed that the cognitive theory of multimedia learning can help facilitate meaningful learning.

The cognitive model of multimedia learning of the human information processing system is represented in figure 2.2 below. It is a cognitive theory of how people construct knowledge from words and pictures.

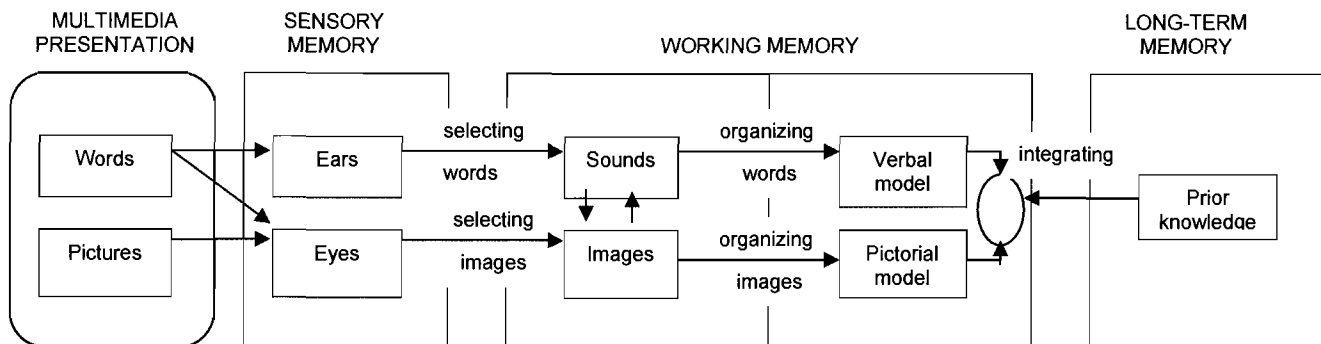


**Figure 2.2 The cognitive theory of multimedia learning (Mayer, 2001:44)**

According to Mayer (2001:43-45), the boxes represent memory stores as described in the multistore model of the information processing theory earlier (cf. 2.2.1.1), being sensory, short-term and long-term memory. Pictures and words as a multimedia presentation enter the sensory memory through the eyes and ears. The sensory memory allows pictures to be registered in the eyes and is held as visual images for a short span of time in a visual sensory memory. Text (printed words) is processed in the visual channel and then moves to the auditory channel. Spoken words and sound are registered in the ears and are held as auditory images for a brief time in the auditory sensory memory. The core of multimedia learning takes place in short-term memory where knowledge is held temporarily. Short-term memory is divided into two sections based on the two sensory modalities, namely visual and auditory. The left side represents raw material in the form of sound (words) and images (pictures), with an arrow from sounds to images representing the mental conversion of a sound into visual image. The arrow from images to sounds represents the mental conversion of a visual image into a sound image. The right side represents knowledge construction of visual and verbal mental models and the link between the two (Mayer, 2001:43,44). The main cognitive processing needed for multimedia learning is represented by the arrows labelled *selecting* (that move from the presented material to short-term memory), *organising* (moving from one kind of representation in short-term memory to another), and *integrating* (that move information from long-term memory to short-term memory and between visual and auditory representation in short-term

memory). The last box is labelled long-term memory. The arrow from long-term memory to short-term memory represents the knowledge that a person has acquired that must actively be brought to short-term memory so that one can actively think about this material in long-term memory (Mayer, 2001:43). Mayer (2002:60) states that in the cognitive process of integrating, the learner mentally connects the verbal and pictorial models as well as the applicable prior knowledge from the long-term memory.

Mayer (2001:53-57) outlines five steps that must be followed by learners if meaningful learning is to take place in a multimedia environment. The learner need not follow the steps in a particular order, but is required to coordinate and monitor the five processes. The five processes are: selecting relevant words for processing verbal short-term memory; selecting relevant images for processing in visual short-term memory; organising selected words into a verbal mental model, organising selected images into a visual mental model; and integrating verbal and visual representations as well as prior knowledge.

Basic assumptions of a cognitive theory of multimedia learning of how the human mind works with respect to learner involvement with verbal, visual and visual-spatial thinking are discussed below. They are the dual channels assumption, limited capacity assumptions and active processing assumption. The information delivery view is also discussed below since this view describes how information can be delivered by means of pictures or words, resulting in the information being stored in memory.

#### **2.2.3.1 Dual channels**

The dual channel assumption claims that humans possess separate channels for processing visual and auditory information. A visual-pictorial channel and an auditory-verbal channel exist separately to process information, using the eyes and ears respectively (see Figure 2.3).

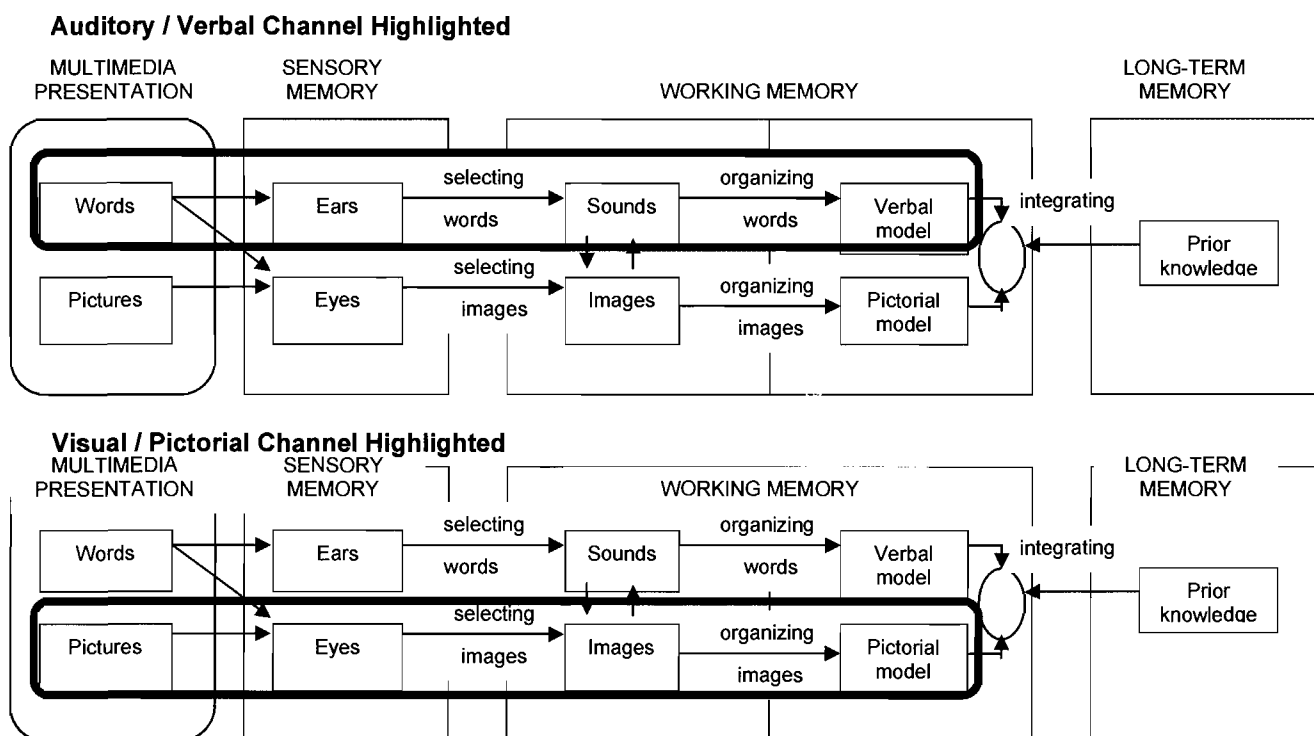


**Figure 2.3 The auditory/verbal channel (Top Frame) and the visual/pictorial channel (Bottom Frame) in a cognitive theory of multimedia learning (Mayer, 2001:47)**

Figure 2.3 shows that when information is presented to the eyes through illustrations, video or on-screen text, information is processed in the visual channel. When information is presented to the ears through narration, it is processed in the auditory channel (Mayer, 2001:46). The construction of both the verbal and pictorial models can be influenced by prior knowledge that is retrieved from long-term memory. Both channels are integrated into one structure to be stored in long-term memory (De Westelinck, Valcke, De Craene & Kirschner, 2005:557).

Three studies, in which students viewed a narrated animation about pumps or brakes or they listened to a narration, have revealed that students learn more deeply from multimedia using text and picture explanations than from a verbal explanation (Mayer, 2002:62). Shuttleworth-Jordan (1994:296) states that Allan Paivio's dual-coding theory from 1986 suggests that information is remembered better, when both verbal and visual codes are used together and not when it is used alone. He maintains that if one forms a mental image of verbal material one is trying to learn, the ability to remember is enhanced to a greater extent than if one tried to remember verbal material on its own. Paivio's theory has formed the basis for the dual channels of information processing assumption (Mayer, 2001:46).

### **2.2.3.2 Limited capacity**

According to Mayer (2001:48-49), the limited capacity assumption assumes that each channel (visual and audio) in the human cognitive system has a limited cognitive capacity that can process information. A learner is only able to hold a few images in short-term memory at any given time when illustrations or animations are presented. It is important to note that these images are only fractions of the material presented, held in short-term memory, for example, a few mental images of an animation, or a few words from a narrated presentation. This limited capacity, processes the knowledge information simultaneously along each channel and can become overloaded. Research has revealed that students learn more deeply from multimedia presentations in which irrelevant words, sounds and video are excluded rather than included (Mayer, 2002:65). It is, however, important according to Mayer and Moreno (2003:50), that multimedia instruction should be designed in such a way that it minimises unnecessary cognitive load.

#### **2.2.3.2.1 Cognitive load theory**

According to Wikipedia (2006), the cognitive load theory, was developed by John Sweller. This theory states that when students have low-prior knowledge in a field of study, cognitive load will be high when no guidance is available to process the new information. Graphic representations are said to limit short-term memory demands by allowing many elements to be treated as a single element in short-term memory (Moreno, 2004:102). Wikipedia (2006) describes three types of cognitive load, namely intrinsic, germane and extraneous cognitive load. Intrinsic cognitive load means that all instruction has a natural difficulty associated with it. Germane (relevant) cognitive load refers to the processing, construction and automation of schemata (diagrams/representations). This means that learners learn through devoting more cognitive resources to tasks that are relevant to the work at hand, with more motivation. According to Moreno (2004:102), extraneous (irrelevant) cognitive load refers to unnecessary cognitive load that may hurt learning as the learner's limited short-term memory resources are used for activities that are irrelevant to gaining an understanding of the work. This is especially the case for low-prior knowledge learners using discovery-based multimedia, who may experience cognitive overload when processing complex verbal and pictorial representations with no guidance. It is, therefore, recommended that the instructional design for low-prior knowledge learners should increase germane cognitive load and decrease extraneous cognitive load (Moreno, 2004:102). Soloman (2007) states that if text is essential in ensuring clarity then it is advisable to place it on the diagram rather than separate, which will reduce cognitive load associated with searching for relations between the text and the diagram.

### **2.2.3.3 Active processing**

The active processing assumption supposes that meaningful learning can take place if learners engage in considerable active cognitive learning by paying attention to relevant incoming information, organising selected information into logical mental representations, and integrating mental representations with other knowledge. This means that the learners select relevant words and pictures, organise them into understandable mental representations and integrate mental representations with other appropriate knowledge, so as to make sense of the presentation. This assumption views learners as active and not processors of information. This assumption has been illustrated in two studies, where students viewed a multimedia presentation about lightning that included either personalized or non-personalized text. Learners performed better when the words were presented in conversational style that was more personalised rather than a detailed description style (Mayer, 2002:67; Mayer, 2001:44).

### **2.2.3.4 Information delivery**

The information delivery theory of multimedia learning assumes that two separate presentations (verbal or pictorial) of the same material are better than one multimedia explanation, due to the fact that the learner is exposed to the same explanation twice (Mayer, 2001:66). Mayer (2001:66) states further that, according to this theory, once information is received in one format (e.g., words), it is a waste of effort to deliver the same information in a different format (e.g. pictures) because it leads to redundancy as no new information is added. It is also the view of this theory that multiple deliveries are not needed because the same information is delivered twice, for example, on-screen text does not need to be repeated by an animation. It is believed that as long as the delivery of words is fully received by the learner, students who receive presentations in words, or in words and pictures, should perform the same when assessed in tests. Mayer also discusses a more moderate view of the information-delivery view. He states that multiple deliveries may result in more learning if a delivery route is fully or partially blocked by, for example, learners who prefer one mode of presentation to another. The theory of information delivery has not been supported by research outcomes, because learners have consistently performed better on retention and transfer when they received the integrated rather than the separated presentation (Mayer, 2001:93). The reason for this is that the information delivery theory accounts for simple information that the learners add to their memories, but it does not account for how people learn conceptually deeper material. Therefore, the information delivery view does not support the design principles for multimedia learning (Mayer, 2001:93-94).

### **2.2.3.5 An evaluation of the cognitive theory of multimedia learning**

According to Mayer (2001:68), the cognitive theory of multimedia learning, holds the view that, multimedia presentations (e.g., words and pictures) have the potential to result in deeper learning and understanding than do presentations presented in one format. The advantage of this theory is that learners are able to hold corresponding verbal and pictorial representation in short-term memory at the same time, therefore, increasing the chances that they will build mental connections between them (Mayer, 2001:69). This has been proven by research by Mayer (2001:93) in that he states that students have remembered better and transferred knowledge better when they received integrated rather than separated presentations. Researchers of multimedia design, however, do not support the information delivery theory, due to its failure of not providing a substantial explanation of how people learn more intensely.

## **2.3 CONCLUSION**

This chapter focussed on a literature review of the theories relevant to multimedia learning. The cognitive learning theories discussed, imply that when one learns, one obtains new ways of processing information and also revises existing processes of processing information. The chapter also focussed on the cognitive theories that relate to the processing and storage of information. It was established that information-processing describes how mental processes function and how information is taken in, stored and used. Three forms of information-processing of learning namely the: multistore model, levels of processing model and connectionist model were discussed. Generally, the information processing theory's multistore model indicates that the human mind encodes information in the sensory register (visual and/or verbal) and perception then determines what will be held in the short-term memory for further use. Thoroughly processed information then becomes part of long-term memory used for learning. The fact that the mind encodes information using the sensors has been one incentive to use many visual and auditory materials in this study so as to ensure retention of knowledge. The constructivist theory revealed that learning is supported by social interaction with peers and adults. It also maintains that prior knowledge is of primary importance, creating new links to pre-existing knowledge. The access of information using ICT is said to lead to an interactive style of teaching, whereby group work and brainstorming of information can lead to meaningful learning. Mayer's cognitive theory related to multimedia learning has shown how people construct knowledge from words and pictures based on research and assumptions made. It is important to base multimedia design on theory-based principles for the following reasons. Research has revealed that students learn more deeply from multimedia using text and picture explanations than from a verbal explanation; students learn more deeply from multimedia presentations in which irrelevant words, sounds and video are excluded rather than included;

low-prior knowledge learners using discovery-based multimedia with complex verbal and pictorial representations and no guidance should have more relevant and less irrelevant information forming part of the multimedia design so as to avoid cognitive overload; and learners performed better when the words were presented in personalised conversational style rather than a detailed description style. The points mentioned in the last sentence have been strongly taken into consideration as they will be analysed so as to assess whether the use of different forms of multimedia on a DVD have an influence on student teaching and learning. Lastly, this chapter has found through a literature study that the information delivery view does not support the design principles for multimedia learning as it fails to describe how people learn conceptually deeper material.

## **CHAPTER 3**

### **INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) AND MULTIMEDIA INTEGRATION IN THE LEARNING AREA SOCIAL SCIENCES (LASS)**

#### **3.1 INTRODUCTION**

Many parents believe that computers will prepare their children for good jobs and so they invest in such technology at home and urge schools to use technology to increase their child's skills (Starr, 1996:1). Neil Postman has written in his book titled, *The End of Education*, that "...reformers should regard the popular support for new technology as an opportunity for positive change" (Starr, 1996:1). Unfortunately, due to poor infrastructure and poor access to communication facilities, access to technology in developing countries is hampered, thus, limiting students' experience with the integration of ICT in teaching and learning (Howie *et al.*, 2005:41).

Technological revolutions in education over the last century have not done away with the existence of the classroom that is still central to the teaching and learning environment. According to Robson (2006:120), technology should not bring about new ways of learning. It should rather include well-designed materials and feedback and so "eliminate a new form of transmission possibly managed by technology". The real impact of ICT on learning is still not well researched (Robson, 2006:120) and so its integration requires careful consideration.

The advent of multimedia has seen the birth of a tool aided by technological hardware that helps teachers to simplify and improve explanations to a new learning community who use multimedia to learn. The purpose of this chapter is to discuss the educational advantages and disadvantages of ICT and multimedia as well as to determine the effect of the integration of ICT and multimedia in teaching and learning with special reference to the LASS in the RSA. Focus is also placed on the factors and principles that must be taken into account when designing multimedia resources that can, for example, facilitate learning and avoid overloading auditory memory.

#### **3.2 DEFINING ICT AND MULTIMEDIA**

According to ANON (2004), ICT is defined as being the technology that is used to gather, control, store, present, provide access to and communicate information, for example, computers, monitors, speakers, VCRs and portable DVD players. ICT is a term that further encompasses any communication device or application that includes radio, television, cellular

phones, desktop and laptop computers, computer and network hardware and software, satellite systems, etc. It also includes the services and applications associated with them, such as videoconferencing and distance learning as well as “peripherals and connections to the Internet” that are intended to fulfil information processing and communication functions. The Kent County Council (2004) agrees that ICT consists of computer features and communication facilities that support teaching and learning activities in education. It is important to remember, according to the latter, that when referring to ICTs one speaks of it in a particular context, for example, ICT in education (Kent County Council, 2004). ANON (2004) and Kent County Council (2004) state that the importance of ICT is not skills acquisition or knowledge of technologies, but rather its ability to create greater access to information and communication and ensure that technology aids the subject being taught and studied.

The use of ICT includes the popular use of recorded material, for example, films on CD-ROM as sources of information used in History and Geography teaching. Internet-based research to support geographical enquiry, micro-computers with suitable keyboards and other devices to teach literacy and writing, etc. are also where ICT features (Kent County Council, 2004). ICT is the means through which multimedia is able to function.

When defining multimedia it must be remembered that it refers to the plural of medium and describes multiple forms of media. It refers to more than one concurrent presentation medium (Wikipedia, 2006; Shepherd, 1998:62). Shepherd (1998:62) describes videos, films, books, magazines and other publications with mixed text and pictures as multimedia products. The latter corresponds with the definition given by Wikipedia (2006), Teow (1999) and Schunk (2004:276) that refer to multimedia as technology that is a combination of electronic delivery devices like computers with other media. This media is, for example, text, audio, still images, animation, video and interactivity to inform or entertain the user, using more than one form of information content and information processing. Therefore, multimedia can be defined broadly as the presentation of material in more than one form (Mayer, 2001:2). The presentation of material in teaching and learning refers to multimedia instruction. According to Mayer (2001:2-3), as well as Barron and Orwig (1995:3), instructional multimedia refers to presentations that are designed to target specific learning outcomes, which comprise of, amongst others, words (audio and printed text), pictures (still and moving), etc. The use of multimedia instruction motivates students and ensures a multi-sensory way of teaching and learning (Barron & Orwig, 1995:7). According to Wikipedia (2006) and Teow (1999), multimedia instructional material, thus, allows the learner actually to see, hear, and use the content to be learned.

Mayer (2001:2-3) has, however, narrowed down the definition of multimedia to correspond with his research base in cognitive psychology. His definition is limited to two forms of multimedia

being verbal and pictorial, which, as chapter 2 discusses (cf. 2.2.3.1), is dual-channel learning. His train of thought is that teaching messages should be designed according to how the human mind works (Mayer, 2001:4).

The definition of multimedia can also be studied in three parts, namely the sensory type (what we see and hear); representational type (the pictures seen and narration heard); and the types of delivery media (these include the hardware used in order to see or hear), for example, the Internet and World Wide Web (WWW) (Mayer & Moreno, 2002:88).

Recorded presentations usually allow interactivity through a navigation system. Interactive multimedia compact discs, like DVDs can be used as effective tools with technology (Wikipedia, 2006; Teow, 1999). Multimedia presentations may be viewed live or as recorded multimedia presentations that are then played in private company with a media player (Wikipedia, 2006; Teow, 1999). Multimedia may be broadly divided into linear and non-linear/hypermedia categories. Linear active content proceeds without any navigation control for the viewer. For example, a movie theatre film that runs from start to finish. Non-linear content is interactive and allows the user to control the progress of viewing by allowing forward or backward movement to different screens. Interactive elements can include voice command, mouse control, text entry or even live participation in live presentations. For example, a book may be considered multimedia if it contains both pictures and text. It may also be considered interactive if the user interacts by turning pages, thus, the term multimedia may have more than one meaning (Wikipedia, 2006; Teow, 1999).

### **3.3 THE EDUCATIONAL ADVANTAGES AND DISADVANTAGES OF ICT AND MULTIMEDIA**

According to Bates (1994), ICT and multimedia offer an opportunity to meet the needs of learners in a cost-effective way. He maintains that the use of high-speed multimedia networks for educational purposes will become more important in the future and need to be taken into consideration due to advancements in technology and the changes in education and training. However, Bates (1994) warns that multimedia in education is seen by many as an extension of computer-based learning, which is associated with high costs incurred for good graphics and video materials. The high costs also lead to restrictions in stimulation of the senses for learners when referring to screen-based text. He maintains that the addition of high quality graphics, audio, and video to text may ensure a huge improvement of computer-based learning. The advantage is that the cost of hardware and the cost of producing multimedia material are dropping rapidly, bringing new cost-effective alternatives in computer technology to the fore and

allowing for, as Schunk (2004:276) states, CDs and DVDs to be used along with computers for teaching.

### **3.3.1 Educational advantages and disadvantages**

According to Shepherd (1998:35) and Wellington (2006:109), the value of ICT, lies in its ability to enhance teaching with the aid of technology. For example, Shepherd (1998:13, 35) quotes a case study by Jane Wellens, of research at a Leicester University in 1998 that revealed that carefully designed computer software helped students to understand and interpret issues since they were able to use such computer software. Students used the software in their own time and as often as they liked. Further benefits included: motivated and excited students; increased achievement; differentiation and individualisation of learning; increased autonomy and independence when learning; an enriched, stimulating teaching and learning environment; students allowed to work at their own pace; a positive impact on standards and attainment; focused student attention; teaching of important facts and skills and enhanced learning of difficult, abstract concepts. This indicates that technology can be advantageous in the teaching and learning of university students.

According to Wellington (2006:88), the advantages of using ICT in learning are plentiful and several claims made by enthusiastic supporters of ICT include: immediate and easy access; any time any place usability; affordability; the power to use multimedia in course content, motivated students and staff; and the claim that staff save time.

Tearle and Dillon (2000:15) believe that multimedia can be designed for educational purposes by targeting specific modules and structuring them to meet the learning outcomes of modules. They state further that multimedia can contain teaching and learning tools that can become integrated in instructional systems as revealed by their pilot study and other researchers who believe that multimedia is educationally beneficial. Shepherd (1998:69) has specified educational benefits that multimedia offer in the conventional educational technology literature. These include increases in: the effectiveness of student learning; the efficiency of educational delivery; and student motivation. He also states that multimedia facilitates: active learning; experiential learning; and learner-centred learning, as well-designed interactive multimedia can stimulate active learning.

The danger that exists, according to Shepherd (1998:64), is that research has shown that educational multimedia actually encourages a reactive rule of response by students. They tend to limit their curiosity, as they are unable to ask questions that concern them. One must, therefore, take care that multimedia design bypasses this problem.

Shepherd (1998:66) states further that it is valuable to be able to bring together a range of teaching materials in one single digital environment so that students can compare, analyse and interact with a wide range of information. This could be, for example, multimedia software technology like CD-ROMs and DVDs as Rice and Wilson (1999:3) state that the development of CD-ROM technology, and more recently the DVD, has allowed for greater multimedia usage and storage of data, which allows for more realistic graphics that attracts students. In the United Kingdom, students are required to make use of new multimedia technologies "to communicate ideas, describe projects, and order information." Baltimore (2003:53) comments that the DVD medium will certainly enhance education especially if teachers take up the challenge to create DVD learning material as they will make significant contributions to teaching and learning. On a small budget, teachers can create and produce high quality video with their own teaching content and so it is important that further investigation be undertaken into the use of the DVD for use in a developing nation like South Africa.

The acronym DVD may stand for Digital Video Disc or Digital Versatile Disc (Dick, 1999:50). Lin (2000:2) clarifies the difference in hardware and software that the acronym DVD applies to. DVD hardware is the DVD playback equipment and the software is the actual discs containing the digital information for playback. According to Dick (1999:50) and Fitzpatrick (2001:1), the DVD is the fastest growing and most successful video technology of any new pre-recorded format in the history of consumer electronics. The DVD is a highly popular family technology as reflected in the American statistics showing a DVD-Video growth rate of 300% from 1999-2000 (Fitzpatrick, 2001:2). With aforementioned in mind, DVD technology can become a contemporary form of ICT used in the RSA. Twenty-first century advances in technology, like the use of DVD perhaps, may well lead to the steady use of ICT in teaching as an additional learning resource used in learning experiences like any other learning resources (White, 2003:148).

Baker, Cohn and McLaughlin (2003:198) state that pre-service teachers complain of restriction to access to school hardware even though the use of ICT in the teaching of History has increased. Thus, the DVD may well be an alternative that can be used with great success. Lin (2000:9) states that the teacher must keep abreast with DVD technology, as it becomes indispensable to the modern classroom. Lin states further that although the DVD will not replace the teacher it does act as an aid that empowers the teacher.

Baltimore (2003:52) feels strongly that by using the DVD one can enhance education as the teacher can call up the multimedia produced in a timely manner. The teacher can even take the portable DVD player and disc into the field and show a quality piece of work at anytime. Rice and Wilson (1999:3) describe the videodisc, or as we know it today the Digital Video Disc, as a

provider of a wealth of information in the form of narrations, visuals, real-time video recordings, dramatisations, animations, etc. More importantly, they state that the DVD allows the user to interact with information, frame-by-frame and select sections to view repeatedly. What is also a highlight feature of the DVD is that narrations can be added to visual representations displayed. According to Dick (1999:51), public libraries could stimulate DVD player purchases by starting a DVD collection. This could also mean that more DVD's could be produced for learning.

Now in the twenty-first century, the use of DVD's in home entertainment and its affordability over the last half a decade has left a gap in educational research on how the DVD and DVD-player can be used for educational teaching when it is a technology that is so commonly used in the home.

The DVD is regarded as being advantageous over other ICTs, such as CD-ROMs and videocassettes. It is also said that the DVD is to be the next generation of digital disc technology (Baltimore, 2003:50). This is attributed to the driving forces listed below according to Crawford (1999:2), Dick (1999:50-51), Anon (2002:1), Baltimore (2003:51), Ficks (2007) and Miyamoto, Harnisch, Yamada and Hiraga (2000:1145):

- The DVD offers an unmatched storage capacity of 4.7 GB as it is seven times greater than the capacity of a CD. Unlike a CD, DVD's are two-sided and can carry twice as much data (as much as 9.4 GB), which is possible to record about 133 minutes of laser disc quality or a broadcast-quality video (MPEG 2).
- It is a more durable storage medium than videocassettes. No physical contact exists between the playing head and disc, and a chemically inactive plastic protects the data surface.
- DVD's offer a higher resolution and higher quality video playback than normal VHS videos.
- Fewer colour "noise"- reduction in reddish colour.
- In South Africa the price of a portable DVD player, like the one used in this study, has dropped from R2 500 in 2004 to R250 in 2007. DVDs cost less than R3.
- DVDs have the ability to combine text, audio, photographs, animation and videos, and are playback only.
- DVDs are portable, have exceptional image quality and are flexible compared to traditional videotapes and CD-ROMs.
- The DVD disc and player allows the user to interact with the video and control its navigation as it has an interactive menu allowing random selection of its contents from the menu screen.

### 3.3.2 Infrastructural disadvantages

According to the White Paper on e-Education (Department of Education, 2004b:7-8), the RSA, a developing country, lacks developed infrastructure for ICT. The widening gap between the RSA and the developed world could be detrimental to education in the RSA as research by Kerawalla and Crook (2002:751) reveals. The outcome of their research indicated that more learning takes place when learners use ICT in an informal situation at home when compared to learning at an institution where constraints are even more abundant. According to Pratt (2005:94;96), only a minority of educationally- and economically-advantaged have private access to ICT and the Internet that makes that learning with ICT can become stagnant as less than 10% of the households in the RSA have computers. It must, however, be said that in the last ten to fifteen years the RSA has been involved in political, economic and educational transformation. This was at the same time that ICT was being introduced overseas and education in the RSA was then undergoing radical transformations to amend the inequalities of apartheid. The RSA thoroughly researched the implementation of ICT internationally, learning from countries like the United States of America (USA) who were forerunners in the field. The RSA was also in a favourable position as it was economically stronger than many of the sub-Saharan countries, which ensured that contemporary initiatives could be introduced (Pratt, 2005:93). Despite the RSA being very well prepared by the implementing of ICT policies in educational institutions, it does not have the resources of developed countries to put it all in place.

Inequalities still exist within educational infrastructure where power supply, communication facilities and access to computers at schools level do not exist (Howie *et al.*, 2005:13; Pratt, 2005:93). In 2000, only 57.1% of schools had a power supply; less than 15% of schools in the RSA had access to computers for teaching and learning; and approximately 70% of the rural South African schools did not have access to computers (Howie *et al.*, 2005:xviii,14). By 2003, only 26.5% of the schools in the RSA had computers showing that the rate at which learners are able to use computers for teaching and learning is very slow (Department of Education, 2004c:12). The reality of the situation is that learners will not have access to the Internet in the near future. ANON (2004) states that worldwide ICT promotion is taking centre stage as there is a concern that unless less technologically advanced areas are given a chance to catch up, the increasing technological advances in developed countries will surely widen the already-existing economic gap between the technological "have" and "have nots". The United Nations is actively promoting ICTs for Development (ICT4D) so as to bridge the digital divide.

According to Pratt (2005:93), tertiary institutions are better resourced when compared to secondary institutions, despite the student-lecturer ratio still being too high for effective learning in tutorial contact sessions with over one hundred students per lecture. Lack of financial

resources due to mergers between universities in the RSA has also drained finances for ICT equipment. Pratt (2005:95) further states that ICT developments at tertiary institutions are necessary as students have limited material resources to fallback on and so ICT can help move them along into the Age of Information Technology. Electronic additions to education should not complicate matters, but rather potentially accelerate and facilitate learning so as to ensure competent citizens join the workforce (Pratt, 2005:96). This, says the latter, is especially important for the RSA since the introduction of OBE. One possibility for South African tertiary institutions is to use cheap technological hardware together with multimedia software that can be prepared cost-effectively by the lecturer. For example, Tiley (1996) elaborates on how in 1993, the United Kingdom launched a Teaching and Learning Technology Programme. It develops software materials to support the university curriculum for Higher Education. Universities were encouraged to use software such as the CD-ROM to access information. Thus, South African students can use a compact disc or even digital videodisc, DVD, as multimedia support material.

### **3.4 THE EFFECT OF INTEGRATING ICT AND MULTIMEDIA ON TEACHING AND LEARNING**

The aim of integrating ICT in teaching and learning in South Africa is to ensure that students' learning can benefit and that the skills and knowledge of students are enhanced so as to guarantee that individuals are technologically on the same level as the global community (Howie *et al.*, 2005:xvi,xvii).

#### **3.4.1 Contextualization**

Governments in developed and developing countries have undertaken many initiatives and adopted many programmes of action with respect to keeping abreast with technologies so as to benefit their economies and human resources (Williams, 2000:252). The application of technology by national governments will have the greatest economic significance as they finance education. Millwood and Terrell (2005:195) firmly believe that technology can bring about changes in the curriculum and teaching, which could enhance the role of higher education in society and the economy. The adoption of multimedia-based technologies by the G7 and many new industrialising countries at the turn of the millennium showed a common concern in exploring the use and feasibility of ICT products and services (Jaeger, Slack & Williams, 2000:277). Jaeger *et al.* (2000:279;281) believe that globally technology is developing extremely fast and at great cost. It is regarded important to produce social learning processes more effectively seeing that it is believed that learning does take place whenever any technology is implemented.

The main concern is, however, that the development of new technologies is widening the gap between countries and the people within them (Butcher, 2001:19). Butcher (2001:19-20) elaborates on how the position of the RSA as a developed nation in Africa, but a developing nation in the world, is favourable as it can explore how technologies can be used to achieve fairness. Developed countries with large resource bases are better equipped to integrate new technologies in teaching and learning thereby benefiting education. A problem arising with the inclusion of new technologies is that there is an assumption that students have access to necessary facilities. This, in fact, widens the gap between the have and have-nots. This is a problem that the RSA must deal with so as to ensure that access to new technologies is available to all in novel and cost-effective ways, for example, the portable DVD player, so as to ensure globalisation of ICT in education. Butcher (2001:20-21) also comments that the globalisation of technological hardware in education and training is the easiest part of the technology-enhanced learning process and is often the cheapest in the long term. The cost of developing course material to be used with such technologies is by far the most costly and time-consuming process.

Despite technology now becoming cheaper and more widely available to those who find a use in them (Jaeger *et al.* 2000:298), the use of ICT in higher education in developed countries is dependent on issues like access, employment, community, teaching and cost (Millwood & Terrell, 2005:195). In Africa, the picture is not rose-coloured. This is due to the underdevelopment of technological infrastructure in sub-Saharan Africa and in other developing countries. Howie *et al.* (2005:1) describes how the governments of developing countries must prevent their countries from falling too technologically behind developed countries and so implement ICT in an efficient and cost-effective way. The aforementioned gap in ICT has grown since the introduction of the Internet. Only 3% of the world's population use the Internet with more than 40% being in Scandinavia and the USA, and 25% in the European Union. This is reason for concern as there is a progressive use of ICT in the general act of learning worldwide (Wellington, 2006:79).

The South African National Technology Online Conference in 2003, which also drew an international audience, focussed on finding solutions to problems of limited student access to computers and the Internet. These included: longer hours at the ICT learning centre; the use of blended learning approaches (ICT learning and face-to-face contact); scheduled classes with access to computers; strategic placement of computers accessible to students; greater availability of technological resources and importantly, support for learners in the form of content on a disc like a CD-ROM (Pratt, 2005:94). The solutions tend to stem from a need by the students to have the technology at their disposal for convenience and extra facilitation. This means that ICT must be integrated into the curriculum.

Millwood and Terrell (2005:200) believe that tertiary institutions are and should be at the forefront of developing new perspectives for teaching and learning. In light of the aforementioned, Millwood and Terrell (2005:201) and Howie *et al.* (2005:109) are of the same opinion regarding the importance of pre-service training of teachers in the field of ICT in education. Millwood and Terrell (2005:201) have found that in the United Kingdom few tertiary institutions offer comprehensive programmes of ICT in education, which is problematic as a tertiary institution's role is central to building knowledge. Howie *et al.* (2005:109) further justify this matter with the revelation of the outcome of the SITES Module 1 study that there is a lack of training regarding the integration of computers into different learning areas at secondary level which should be introduced at tertiary level.

Since the 1990s, the United Kingdom has seen the advent of multimedia learning materials for university courses in different disciplines using the latest cost-effective and creative multimedia tools (Millwood & Terrell, 2005:196). Baker (1997) and Taylor (1999:95-97) elaborate, for example, on the Integrated Learning Systems (ILS) experimented with in the United Kingdom. The ILS is reported to be helpful and motivating, by teachers who select the appropriate material to suit a learner's particular needs. It involves learning through ICT, by using multimedia to create structured, individualized teaching in numeracy and literacy. The multimedia features ensure the demonstration of complex concepts allowing the learners to progress at their own pace, free from peer-pressure. In Norway, multimedia is regarded as an efficient method used to present information and that government is currently funding a school-based programme for the development of research on the "pedagogical use of information technology" (Jaeger *et al.*, 2000:289-290).

The use of different mediums for teaching and learning has been extensively researched. Nugent (1982:163) states that originally, media was considered to be a never changing system, but later comparisons between media led to opinions of superiority of one type over the other. This led to further scrutiny of the differences within and between media. Salomon (quoted by Nugent, 1982:163) states, "Media's ways of structuring and presenting information, are media's most important attributes when learning and understanding are considered... ." Mayer (2003:127) advises that multimedia presentations be designed in ways that are consistent to how people learn so as to serve as an aid to learning. It is necessary to discuss the latter with regard to the use of different multimedia in teaching and learning to ensure that the most suitable multimedia is used for learning.

### **3.4.2 Specific multimedia considerations for teaching and learning**

Current research indicates that students learn more deeply from well-designed multimedia presentations than from traditional messages on their own. It is believed that text, visual and audio combinations are powerful tools that can be used to promote student understanding (Mayer, 2003:127). Bates (1994) identified this issue in the previous millennium when he mentioned that design requirements for learning in the twenty-first century will require learners to access audio, video, text, and data as learning will become more informal and lifelong. Schunk (2004:276) has stated that multimedia offers great possibilities for integrating technology into teaching. However, research has only revealed a small effect for the benefits of multimedia on learning.

Mayer and Moreno (2002:88) maintain that although verbal presentations have dominated education throughout time, there is evidence that student understanding can be enhanced with the addition of visual forms of presentation. This is further explained by Schunk (2004:277) who states that when verbal and visual information are combined during teaching, students benefit from the dual channels assumption (cf. 2.2.3.1). This is so because simultaneous presentations help learners form a connection between words and pictures as they are in the short-term memory at the same time, therefore, learning from multimedia. Schunk (2004:277) also describes how the ability to exercise control over the pace of teaching and the use of animations with movement and simulations by learners are teaching methods that support multimedia learning.

As early as 1982, research findings by Nugent (1982:163) indicated that symbolic representations could have an effect on learning. Pictures, print and audio were used to assess whether learning could be aided. At school level, grades alternated the use of media (pictures, print and audio). The same content was used for each presentation. The outcome indicated that pictures, print and audio helped the learners understand better. This refutes the information delivery theory (cf. 2.2.3.4). Later, the content presented was different for each type of media, and was presented simultaneously, the results indicated that the information was not processed as effectively as when it was presented on its own (Nugent, 1982:163). Nugent (1982:164) states that pictures, audio and text are understood, stored, encoded and retrieved by learners in different ways. He also refers to research where a comparison between text and audio media, used as mediums of instruction, hailed no difference in the learning of university students.

Nugent (1982:164) refers to a 1976 study by Nasser and McEwen that researched university students. English text was used as the subject and the study showed that text and audio was

superior to audio alone, but not superior to text-only. Further research by Nugent (1982:164), however, revealed that audio media is advantageous to students with underdeveloped reading skills.

Nugent's (1982:164) research reveals that text is more advantageous as the material becomes more complex. This once again highlights that text has an important advantage for the presentation of complex materials. Nugent (1982:164) commented that Rohwer and Harris's 1975 research also showed an advantage for text, which they attributed to content differences. This study also highlighted the fact that a subject, with its unique characteristics, influences the success of learning via picture or audio presentations. Nugent (1982:164) also reviews research by Baggett (1979), Gropper (1966) and Levin (1973) who compared visuals to text in research using university students and found no significant difference between learning from these different presentations.

Nugent (1982:165) conducted two studies of his own using picture, text and audio in different combinations with the aim of determining how they influence learning. The results of his study showed that when content was the same in visual, audio and text media school children learned equally well from all types of media respectively, but when the visuals were combined with text or audio learning was generally maximized. This shows that a strong relationship exists between multimedia presentations and student learning. Mayer (2002:63) similarly concluded from research at tertiary institutions that students learn more deeply from multimedia explanations than from a verbal explanation that involves words and visuals than words alone.

Nugent's (1982:164) first study compared the learning of factual information (knowledge) at school. Seven instructional treatments were prepared from the same content and one control group was used. The main analysis was a post-test one-way ANOVA. The outcome of his research revealed that visuals and audio produce learning superior to audio and text, thus, highlighting the effect of multimedia presentations on student learning as being more advantageous when visuals are used over text in oral presentations (Nugent, 1982:165). Nugent states, however, that visuals may offer many dimensions for coding information, but lacks the focussing quality of text and audio in presenting depth of information. Results by Mayer (2003:127) show how multimedia learning promises that a combination of visuals together with audio will promote deeper learning in students than audio alone, which is what Mayer's cognitive theory of multimedia learning (cf. 2.2.3) has the potential to do.

One can, therefore, say that representation of information, by both visuals and audio methods, is generally more powerful than single presentations. Nugent (1982:165) confirms this by stating that the combination of visuals and audio or text is generally superior to single modes of

presentation, thus, making that the two can work together in facilitating learning. He states that it is generally accurate to say that when representing information it is best to use more media channels, as the outcome will be so much more meaningful. Therefore, showing how the relationship between multimedia presentations and student learning ensures a meaningful outcome.

In a second study undertaken by Nugent (1982:172), the content presented in the visual medium and audio medium was not the same. The research was concerned with student ability to process, separately, visual and audio material. Three treatments were applied and since the content was different, the control group was the group that did not receive the specific media that was assessed. Visual and narration questions were posed. The results were compared using two one-way ANOVA'S. The results indicated that there was that no significant difference in the score of learners who viewed the visual presentation and those seeing the visuals with audio. Nugent explains that the learners were able to process both the visual and audio information simultaneously as discussed in the cognitive theory of multimedia learning (cf. 2.2.3). Thus, he says that the presence of visuals did not interfere with learning of the information presented in the audio track and that the presence of narration did not appear to interfere with visual learning. Despite there being no interference, there was no facilitation and so it is crucial to design instructional material so that it delivers maximum results and complements students' learning styles.

According to Bottge (quoted by Cabot, 1998:9), technology alone cannot improve teaching and learning. In order for it to be effective, it must be "grounded firmly in curriculum goals, incorporated into sound instructional process, and deeply integrated with subject-matter content." For example, UNESCO (2002:3,26) aims to ensure that all countries use technology in schools, integrating computers and multimedia into the education system. Projects undertaken by UNESCO (2002:61-62,109) require countries to integrate ICT within the curriculum of a subject and get teachers and learners to create multimedia software to help them with teaching and learning.

The sentiments of Bottge above have been justified in Millwood and Terrell's (2005:200) findings that have indicated that with the aid of technology learners can now discuss the Geographical theory of plate tectonics in a way that was not possible some thirty years ago. They, like the RSA government, believe firmly that technology can and should be used to promote the active development of knowledge and understanding and so not let it stagnate.

### **3.5 ICT AND MULTIMEDIA INTEGRATION IN THE LEARNING AREA SOCIAL SCIENCES**

The inclusion of ICT into the national curriculum has led to the integration of multimedia in teaching and learning so as to enhance the learning of learners, provided by access to ICT resources.

#### **3.5.1 Contextualization**

Before 1994 History and Geography were two separate subjects in the senior primary and junior secondary programmes (Van Eeden, 1999:11-15; Smit, 2000:168-170). When the new curriculum for schools was drafted in August 1996 it introduced eight compulsory Learning Areas, one of which was Human and Social Sciences (HSS), as stated in the National Curriculum Statement – Parents' Guide (Department of Education, 2004a:2). HSS was a combination of History and Geography, presented as an integration of both disciplines. The learning programme for HSS was part of the General Education and Training (GET) Band of the National Qualification Framework. At this stage the system of education in the RSA was in transition and the educational system was being phased out and replaced with a new education system, known as Curriculum 2005 (Van Eeden, 1999:13,103,106; Smit, 2000:166-168). In 2002, the Department of Education presented its streamlined and strengthened version of Curriculum 2005, namely the RNCS Grades R-9 (Schools) Policy for Social Sciences stating that History and Geography must now be taught separately, but as linked disciplines known as the Learning Area Social Sciences (Department of Education, 2002:4). The LASS ensures that students have an understanding of the world they live in, the relationships between people, and between people and the environment over space and time as they are influenced by social, political, economic and environmental circumstances, as well as by people's values, attitudes and beliefs (Department of Education, 2002:4). The LASS is part of the GET Band where it is a compulsory Learning Area within the Senior and Intermediate Phases, and its outcomes are covered within the Learning Programmes of the Foundation Phase part of the RNCS, currently known as the NCS (Department of Education, 2002:3).

The core of the learning area is, thus, people- referring to the study of human diversity, places (referring to physical space) and time (referring to the passage of time). Therefore, the LASS is the general term for the study of the world, past, present and future. It strives to attain a deep understanding of all the factors that shape identities, people, places and movements in time (Orsmond, 2004:224).

Orsmond (2004:225) describes History as being a study of the past that informs the future. It deals with the problems, behaviours and actions of people through time. History teaches about the cause and effect of events in time. Geography is described by the NCS (Department of Education, 2003:9) as "a science that investigates the spatial distribution of people, physical features, events and human environment interactions. It is concerned with spatial patterns and processes that occur and develop over time. It focuses on poverty, development, sustainability, inequality and environmental management in the context of specific places and regions." According to the National Curriculum Statement for Social Sciences (Department of Education, 2002:7), the learning outcomes for History within the LASS can be summarised as focussing on:

- Enquiry skills to investigate past and present;
- Historical knowledge and concepts, analysing change over time;
- Interpretations of events in History; and

The learning outcomes for Geography can be summarised as follows:

- Enquiry skills to investigate and answer geographical questions;
- Acquiring geographical and environmental knowledge and understanding;
- Organising and analysing information about social and environmental issues and problems.

Rice and Wilson (1999:3) have stated that the use of technology in the Social Sciences classroom that benefit constructivist teaching and learning include CD-ROMs, DVDs, multimedia and the Internet. The benefits they claim, of such integration in this learning area include the ability to obtain information in the form of documents, photographs, video, audio clips and virtual experiences as well as exposure to different points of view so that learners can construct their own knowledge.

The presentation of History and Geography within education is very complex. After two decades of observation at the University of Leicester in the United Kingdom it was shown that ICT - in this case computers and the Internet - has been used more progressively in Geography to support and reinforce learning and teaching (Castleford & Robinson, 1998:375). Within the discipline of History, quite the opposite has been revealed. Many teachers abroad use technologically impressive ICT facilities to satisfy Department inspectors, even though computers, in their opinion, have not had the same effect and powerful impact on the History classroom like video recorders and televisions have had (Haydn, 2000:89-99). The latter may be attributed to the technological drive present in developed countries like the United Kingdom where the pressure on teachers to use computers in their teaching is so great that a "zero tolerance of non-ICT literate teachers" exists (Haydn, 2000:99). Technologies used in History classrooms are, however, mostly first- and second-generation technologies such as combined audio-visual aids unlike the more sophisticated third-generation technologies used in

Geography, especially when referring to the requirement of Geographical Information Systems (GIS) in the new curriculum (Howie *et al.*, 2005:7). For example, the NCS Grades 10-12 (General) Geography, requires the use of ICT to be used in the study of GIS and Geographical Positioning System (GPS) that ensures the attainment of Geographical numeric skills (Department of Education, 2003:13).

### **3.5.2 Media technology useful in History**

The use of ICT can enhance History teaching and learning by making more historical information available for learners to access and it also promotes “interactive” learning (Haydn, 2000:104). Haydn (2000:102) further reports that more and more evidence shows that learners enjoy using computers, that it improves their attitudes to school and that they feel that they “learn better” using ICT. Due to the nature of the discipline of History that deals with many sources, Hillis (2002:309) states that terminology found in primary sources, is of such a nature that students find it difficult to understand its content and meaning. He maintains that the multimedia facility to record text sources and link unfamiliar words to a glossary does help students to understand better. The use of digital historical resources (e.g., primary source documents) in History teaching and learning can, however, lead to information overload due to the large volumes of information and lack of organised structure on the medium of projection. Suggestions have been made by Lee (2002:511) to use primary source documents to focus teaching, guide inquiry into historical problems, facilitate the application of knowledge and assess student learning. Evidence also exists that university students use digital historical resources to construct historical arguments, which are presented differently to arguments with the aid of text sources. Research by Lee (2002:512-513), on university students also showed that students related more to the digital historical resources that they used and they understood the historical cause-and-effect relationship better using digital historical resources.

Researchers of History teaching and learning, suggest that multimedia resources in this discipline must include a wide variety of resources, for example video, maps, photographs, timelines, etc. This was evident in student ratings of film and video, as the most useful, since it helped them to visualise events. Results also showed that the students gained knowledge of the historical events presented in the resources. These and other resources, which are, on-screen information sources are technological experiences, which have been suggested to generate opposite reactions to reading traditional historical texts from books (Lee, 2002:513-514). However, Van Eeden (1999:211) states clearly that it is difficult to distinguish between all types of primary and secondary sources, when application of knowledge is required by students to answer a related question, as sources are used as resources in History teaching and learning.

In History teaching, the sources mentioned in Table 3.1 are listed as excellent sources of media, but Hayden suggests that History teachers need to think about how ICT can make their job more effective when choosing their sources (Weiner, 1995:10; Van Eeden, 1999:213-216, 235-236; Haydn, 2000:106-109).

**Table 3.1 Resources used in History**

| History                                                                                                                                                                                                                                                                                                                         |                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Resources typically used in teaching                                                                                                                                                                                                                                                                                            | Resources using specialised ICT to support History                                                        |
| Video recorder and television                                                                                                                                                                                                                                                                                                   | Self-produced video clips on Windows movie maker with music                                               |
| Computers: data-handling programmes; historical games                                                                                                                                                                                                                                                                           |                                                                                                           |
| Word processors that edits, organises historical information and improves data manipulations and interpretations                                                                                                                                                                                                                |                                                                                                           |
| <i>Primary source materials that are:</i>                                                                                                                                                                                                                                                                                       |                                                                                                           |
| <ul style="list-style-type: none"> <li>• oral (interviews, memoirs, etc.);</li> <li>• written (maps, letters, poems, records, etc.);</li> <li>• archaeological (human remains, artefacts like paintings, tools, etc.);</li> <li>• visual and audiovisual (video's, photographs, films, CD's, monuments, ruins, etc.)</li> </ul> | <ul style="list-style-type: none"> <li>• Internet database</li> </ul>                                     |
| <i>Secondary sources include:</i>                                                                                                                                                                                                                                                                                               |                                                                                                           |
| Historical films and historical fiction, text sources from a library, all used to help students make judgments.                                                                                                                                                                                                                 | The Internet: historical web sites and electronic journals that provide multimedia texts with definitions |
| Documentary radio programmes and video documentaries                                                                                                                                                                                                                                                                            | CD-ROM software with graphics and large volumes of information                                            |
| Newspapers and cartoons                                                                                                                                                                                                                                                                                                         |                                                                                                           |

Table 3.1 shows that although the usual resources used in History teaching do not require the use of ICT, Internet historical websites and CD-ROMs are sources with a wealth of information that can successfully be used in History teaching. According to Deacon (1998:5-6), universities in the RSA have a positive approach to technology, but the humanities tend to show an

inequality of access and use of ICT among both students and staff. He further explains that the poor access and mixed attitude to the use of computers in the humanities has had both a cause and effect on the slow use of computer technology for teaching and learning in History teaching.

### **3.5.3 Media technology useful in Geography**

Butt (2002:173-174) states that the use of ICT in Geography teaching is a legislative necessity due to the technological changes in the world, which require that students be prepared and well equipped to work with ICT. He also states that ICT should only be used in teaching and learning if it is effective in achieving the learning outcomes, effective in time and effort spent, and if students can show that technology is useful in helping them learn Geography.

According to Lambert and Balderstone (2000:110-111,138,148), ICT has an undisputed potential of improving enquiry learning in Geography and that picture and word association help develop learners' vocabulary when used in visual material. However, research findings have noted that the use of content rich resources may lead to learners encountering difficulties in using the content for their own geographical enquires. One must be aware of the link between poor quality, poor use of resources and ineffective teaching and learning in Geography, as this may counteract the benefits that the inclusion of ICT and multimedia bring to Geography teaching and learning.

Durbin (2004:263) discusses the use of visual resources for teaching Geography and focuses on tele-visual resources referring to programme materials viewed on a television screen. He maintains that clips are useful for very specific learning outcomes, especially when the tele-visual resource contains short pauses. These short pauses are more a switch of scenery so as to break up the narration of a programme and so also allow for one to register the content in memory. Therefore, breaks are important and must be used to enable the student to pause and recall what has been taught. The little research that has been done into how learners learn from the medium of television serves as a caution to teachers using multimedia. It reveals that students do not interpret the pictures selected by a teacher who produces the programme. The learners did not record the visual information into memory. They simply wrote down the words spoken by the narrator (Durbin, 2004:263). Similarly, Taylor (1996:26) warns that students only glance through large volumes of multimedia material. They often enjoy the visual presentations, but no significant learning takes place.

Due to Geography being regarded as a highly visual subject it is said to be complimented with the use of multimedia (Peterson, 1994:27). It is also maintained that any medium that delivers images as well as text is advantageous to students learning Geography (Shepherd, 1998:65).

For example, difficult topics or concept can be highlighted by the use of video, graphics or models (Taylor, 1996:26). Therefore, resources and how they are used play an important part in the intellectual development of learners (Lambert & Balderstone, 2000:111). This is supported by research showing that audio-visual resources can be used effectively to support teaching and learning in Geography because visual presentations and representation are integral parts of Geography education as seen in Table 3.2 below (McKendrick & Bowden, 1999:9-11; Krygier & Reeves, 1997:5; Stanfield, 2002; Lambert & Balderstone, 2000:110,111; Kent, 2003:342).

**Table 3.2 Resources used in Geography**

| Geography                                                                       |                                                                                                                                                                                                         |
|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Resources typically used in teaching                                            | Resources using specialised ICT to support Geography                                                                                                                                                    |
| Video and recorded television programs                                          | Videos of specific themes recorded on camcorders and edited onto videos                                                                                                                                 |
| Slides, music                                                                   | Digital images (from Internet, digital cameras, etc.) to computers and using computer overhead projector links                                                                                          |
| Chalkboards, overheads, videos, CD's                                            | Recordings of sounds from nature, data logging, Geographic Information Systems (GIS)                                                                                                                    |
| Atlases that integrate text, images, maps, diagrams, physical models and graphs | Power Point presentations, databases and spreadsheets                                                                                                                                                   |
| Textbooks, journals, models, artefacts, resource sheets                         | Download video clips of current satellite imagery via the WWW, share answers between schools via email or we links                                                                                      |
|                                                                                 | Information rich sources and multimedia available as presentation packages on WWW and CD-Rom                                                                                                            |
|                                                                                 | Simulations and modelling software, animated diagrams and video clips that are regarded as excellent tools for teaching difficult concepts, as well as self-produced video clips on Windows movie maker |

Table 3.2 clearly shows that the use of ICT in Geography is widely used, especially for its visual and audio potential. It also shows how ICT can help geographers to collect, organise, analyse and present information in words, maps, diagrams and tables from primary and secondary sources (Freeman, 2002:205). It is important to note that the resources using ICT like the video clips obtained from space and the computer multimedia available on the Internet are currently

being used by the Pennsylvania State University in the USA. It is used to access educational resources (Krygier & Reeves, 1997:4). Geographers at United Kingdom Universities such as Leeds and Manchester, amongst others, unanimously believe that the use of audio-visual sources for teaching and learning diversify teaching styles. 69% of them feel that the use of audio-visual sources, including ICT, meets student demand for audio-visual resource-based information (McKendrick & Bowden, 1999:12).

A slight disparity exists between the two disciplines' use of ICT as more advanced technology is used in Geography more regularly as compared to the use and integration of technology in History teaching and learning. Research in the USA and England has shown that learners in Social Sciences prefer ICT in teaching. A greater focus is, however, being placed on the integration of ICT in Social Sciences, as learners prefer visual effects, moving pictures, and other entertainment with educational content to learn from (Haydn, 2000:99; Deane, Ruthven & Hennessy, 2003:141; Miltenoff & Rodgers, 2003:34).

### **3.6 FACTORS AND PRINCIPLES TO CONSIDER WHEN DESIGNING MULTIMEDIA AND MULTIMEDIA MATERIAL**

Due to the nature of humankind, people prefer to take in and process information in different ways (Felder & Solomon, 2006). This means that if some learners prefer visual presentations and others verbal then a multimedia presentation would be effective in delivering information effectively to both kinds of learners. It is, therefore, important to focus on factors such as the use of text, etc. when designing multimedia material. Important principles, which research has shown to result in higher performance by students in tests, must also be considered. This highlights the importance of ensuring that multimedia must be well designed so as to accommodate all types of learners.

#### **3.6.1 Important factors to consider when designing multimedia**

Mayer (2003:137) states that using different technologies (for instance computers or DVDs) is important as the fundamental nature of how the human mind works does not change and so if the instructional technologies are designed knowledgeably they can serve as powerful aids to human cognition. Despite the general benefits that multimedia holds it is important to consider important factors that are influential in achieving teaching and learning outcomes when using multimedia.

### **3.6.1.1 Text**

According to Moreno, Mayer, Spires and Lester (2001:178), text has always been at the helm of teaching. Text has also been used extensively in computer and communication technologies, which present large volumes of information in text form. Communication technologies are said to have the potential to improve human learning especially where educational technology allows a learner to develop a social relation with the technology by interacting with it when it is used as a teaching agent, as with text. Wellington (2006:90) believes firmly that it is a “big mistake” to simply place traditional text materials on an electronic screen and hope that it works in a virtual environment. Wellington (2006:90) warns that text, in print form on paper, is sometimes transferred to electronic media without enriching it with moving images, video or audio. This does not enhance the learning process and so multimedia that has the potential to bring dull or difficult subjects to life must be used to enhance text. Text is, therefore, critical to learning with ICT, but its addition to multimedia learning needs careful consideration even though it is not superior or inferior to multimedia combinations (cf. 3.4.2).

### **3.6.1.2 Verbal (descriptive-text) and pictorial (depictive) representations**

Mayer (2001:67-68) suggests that verbal representations require more mental effort to be processed by a learner. Pictorial representations are considered more original forms of knowledge representation, because they are regarded as being more instinctive and closer to the visual experience. Mayer (2001:68) also suggests that presenting both text and pictures invokes deep learning because the learner is required to develop both verbal and pictorial mental representation and connections between them. This is in accordance with Mayer's cognitive theory of multimedia learning (cf. 2.2.3).

De Westelinck *et al.* (2005:558) also describe an alternative theory to Mayer's theory. From research undertaken in the past, they state that descriptive representations, for example, text and a symbol, on a screen, can build on iconic systems (for example *50 km* → ). However, depictive representations (pictures, e.g. →) are said not to build on iconic systems. They maintain that in order to interpret depictive external representations students are required to have prior-knowledge of the meaning of iconic systems. In other words, they maintain that to understand that the airport is 50 km away to the right one must have prior-knowledge of the meaning of *50 km* and the arrow pointing to the right.

Mayer maintains that the depictive representation of the aeroplane is instinctive and is closer to the visual experience than the descriptive representation of distances and directions. He states that the student will process the depictive representation faster than the descriptive one found in

a pictorial model with the correct visual-perceptual relationship. The concern of De Westelinck *et al.* (2005:559) is whether students have enough prior-knowledge to understand the depictive representations as it influences the mastering of iconic systems and so students could have more difficulties or need more time to develop mental modes when faced with new or unknown iconic systems. They want to prevent a mismatch between the iconic sign system of the student and the iconic sign system used in the representation.

The danger of confronting such depictions is high cognitive loads and, therefore, little learning taking place, and so the addition of graphical representation to achieve meaningful learning is not present. The result of research conducted by De Westelinck *et al.* (2005:569) shows that studying text without external graphical representation in the Social Sciences sometimes results in higher performance. This means that the addition of pictures to text is not generally beneficial. Therefore, as De Westelinck *et al.* (2005:571) suggest, developers of multimedia learning material must pay clear attention to completeness of descriptive and depictive learning material, as it is a central characteristic of the representation, and so as to prevent high cognitive load by learners with low prior-knowledge (cf. 2.2.3.2.1).

#### **3.6.1.3 Cognitive activity**

Since the human cognitive capacity is limited, Moreno (2004:101) believes that designers of multimedia for teaching and learning must present new information that encourages students to be cognitively active, increasing germane cognitive load (cf. 2.2.3.2.1), whilst minimizing any unnecessary cognitive load that may cause disturbances in the selection, organisation and integration of new information with prior-knowledge (cf. extraneous cognitive load 2.2.3.2.1).

After examining the results of her study, Moreno (2004:103) found that learning took place and a cognitive load reduction effect was had when learners were guided when given explanatory feedback (a verbal explanation to the students' choice using multimedia). Explanatory feedback proved to be significantly more effective for retention and transfer learning than corrective feedback (a software means of communicating that a choice was right or wrong). Moreno's finding suggests that explanatory feedback helps low prior-knowledge students construct knowledge from a discovery-based environment by decreasing extraneous cognitive load. This is in accordance with the cognitive load theory of multimedia learning theory (cf. 2.2.3) and the cognitive load theory (cf. 2.2.3.2.1). Therefore, in order to process new multimedia material low prior-knowledge students will learn more deeply when guided with explanatory feedback.

Mayer provides important pointers for multimedia designers to promote learning namely presenting explanations in the form of speech rather than text; design personalised

communications with the learner; create participatory rather than linear presentations; and guidance in the form of explanatory feedback. This will be considered in this research since Baltimore (2003:53) feels strongly that when designing a DVD one should stop at certain points and quiz to test learning. This he says is corrective feedback that will give the learner another opportunity for learning and produce a more effective learning experience.

Hillis (2002:314) maintains that when developing multimedia for History teaching it must incorporate a variety of resources so as to develop critical cognition. The variety should include media such as photographs, video, text sources, etc. which must be presented in appropriate contexts to avoid bias, for example. He also maintains that the multimedia used must be aesthetically pleasing. Hillis (2002:314) also refers to the use of explanatory feedback, which will help low prior-knowledge learners to construct knowledge, whilst corrective feedback will also give learners an opportunity to learn.

#### **3.6.1.4 Learner prior-knowledge, experience and ability levels**

When designing multimedia material one must remember that what is best for low prior-knowledge learners is not best for high prior-knowledge learners and vice versa. This phenomenon is known as the expertise reversal (De Westelinck *et al.*, 2005:557, 558). ChanLin (1998:2) states that research findings from 1990 revealed that the use of still graphics causes design difficulties for less able students. This means that lower-ability students spent more time deciphering pictorial and textual information. ChanLin (1998:2) discusses the manner in which text and multimedia are presented and yields interesting results. For example, Mayer and Anderson's 1992 research found that low prior-knowledge learners were able to transfer better what they had learned from a procedural text when visual and verbal explanations were presented simultaneously.

According to ChanLin (1998:1), if a concept is too difficult to understand then the presentation will not be a success, no matter what the combination of media used. ChanLin undertook research in 1998 using three different visual treatments (no graphics, still graphics and animated graphics) with different prior-knowledge levels to research the teaching and learning of procedural knowledge (cf. 2.2.1.1) and descriptive knowledge (cf. 2.2.1.2). It was found that when learning descriptive facts in the low prior-knowledge group, both still graphic and animation treatments facilitated learning. She concluded that pictures in still or animated form enhanced low prior-knowledge and high prior-knowledge learners' learning. It was also found that the effectiveness of visual design in learning procedural or descriptive knowledge is related to the prior-knowledge of the students. When learning procedural facts no significant differences were found among the two treatment groups in the low prior-knowledge group, while

in the high prior-knowledge group, only the still graphic treatment was better than the control group. Therefore, the effectiveness of visual multimedia, included in teaching and learning when learning procedural or descriptive knowledge, is related to the prior-knowledge of learners.

#### **3.6.1.5 Social agency**

According to Lester, Converse, Kahler, Barlow, Stone and Bhogal (1997:364), when students identify with likable characters that seem personally involved in their learning they are more likely to enjoy the learning situation. The likeable character exercises a strong positive effect on the student's perception of the learning experience. The use of people or friendly computer animated beings is recommended in the instructional design process (Lester *et al.*, 1997:365). However, Moreno *et al.* (2001:210) concluded from their study, consisting of five experiments, that a teacher's image in a multimedia lesson does not hurt or offer any intellectual or motivational advantage for students' learning, despite providing extra auditory and visual materials. This outcome does not support the constructivist theory of multimedia learning, which states that the visual presence of a human teacher in a multimedia environment promotes deeper understanding as compared to an environment where the teacher image is not present.

Moreno *et al.* (2001:210) encourage the inclusion of a teacher's image for teaching and learning when designing multimedia as it results in positive outcomes. They also maintain that multimedia programmes can lead to deeper learning if visual materials are combined with auditory explanations of teachers. This they say is true for situations where the learner is a participant and not an observer within the learning environment. Therefore, research supports the use of a familiar, likable auditory explanation, like a teacher's voice in teaching and learning material, as it can lead to deeper learning, despite a teacher's image in multimedia being indifferent to learners' learning outcomes.

#### **3.6.1.6 Animation**

Animated graphics provide users with images and motion. Pointing arrows, captions, labels or other attention-getting strategies are used so that students can take in the information and memorise the descriptive information visualised on the screen. Animation serves as a memory reminder device to enhance memorisation (Starr, 1996:1). ChanLin (1998:2) agrees and states that the use of animation in computer-assisted learning material might have greater impact on students with less prior-knowledge because visual treatments help guide students to make sense of information. ChanLin also cautions that care must be taken when using animations to present knowledge to low prior-knowledge learners because some learners find the learning

demands associated with animations confusing. However, in her research in the high prior-knowledge group only the animation group was better than the control group in learning descriptive facts. The multimedia programmes resulted in deeper learning when the visual materials were combined with auditory explanations of teachers. One can, therefore, say that the use of animations is beneficial to high prior-knowledge learners when they learn descriptive facts, but can create confusion for learners with less prior-knowledge.

#### **3.6.1.7 Video**

According to Houston (2000:353), lecturers in the humanities tend to use active viewing strategies in comparison with lecturers from other disciplines. She also found in her research that the main purpose of using video in lectures was threefold. They are, namely to introduce or summarise topics, provide visual examples and to stimulate discussion. The latter is beneficial to teaching and learning, but Lambert and Balderstone (2000:142) warn Geography teachers to move away from using video and television resources as passive agent in teaching and learning. Television and video resources can be used as helpful teaching and learning aids in that they bring distant places into the classroom; can explain difficult concepts by using images, graphics and narration; and use maps to show locations of places to a wider region in the world. However, one must remember that images must be clear and appropriate, the narration clear; the graphics explanatory and the content must be geographical by nature for Geography teaching. Another point made by Lambert and Balderstone (2000:134,144) is that teachers must use clips from television programmes as they are effective in capturing learners' interest, deal with current affairs such as clips recorded from the news and current affairs programmes, motivates learners due to the visual material used; and stimulates learners' interest in the content. Haydn (2000:99) states that the use of video recorders and television has had a very powerful impact on teaching in the History classroom, in recent years. As much as 90% of History teachers show video clips to learners with primary source images of past historical occurrences. History teachers say that the images become etched into learners' memories for many years, helping them to recall the historical occurrences.

Research in educational media has shown that student participation during media viewing has aided student learning. Research has also shown that media viewing on television has diminished and despite videos and VCRs being popular instructional media, the use of video has diminished as the focus of instructional technology has changed to personal computers and the Internet (Houston, 2000:341-343). This does not, however, cancel out the use of video clips as students have more access to visual material using contemporary technology such as laptop computers and DVD players. Therefore, new technology can ensure that video clips are viewed by learners to help them learn.

### 3.6.1.8 Learning styles

According to Wellington (2006:5) and Magnesen (1983:1), adults learn 10% of what they read, 20% of what they hear, 30% of what they see, 50% of what they see and hear, 70% of what they say, and 90% of what they say and do. It can, thus, be concluded that what people see and hear has a great effect on their learning and memory retention. Further findings show that teaching methods that stimulate the widest variety of senses will generally be the most effective. Therefore, a DVD, which can accommodate multimedia viewing, is an excellent tool for assisting learners with different learning styles.

Wellington (2006:129) states that different students have different preferences for the way in which they learn. This means that some prefer to learn visually (visual), some by hearing (auditory), and others by doing, moving, touching or feeling (kinaesthetic). Various types of learners are discussed by Reay (1997:83), as well as Guimaraes, Chambel and Bidarra (2000), describing how each learner has certain wants and needs, requiring specific training. A summary of each features below with insight into the preferred way in which they learn with a DVD containing interactive media, text, moving visuals and audio clips.

- Active learners want variety, excitement, social activities and, therefore, the type of training required involves group-based activities, learning through execution and lively debates, etc. They tend to retain and understand information by doing something active with it. These are kinaesthetic learners who will gain from learning with interactive media such as text, moving visuals, audio clips. Guimaraes *et al.* (2000) state that the WWW naturally lends itself to active "discoveries" through hyperlinks. Therefore, its main assets include "its multiple navigation possibilities, e-mail, message boards, chat, multimedia, videoconferencing and the highest-level of interactivity" that can be used. Kinaesthetic learners can be supported with images and sound that contextualise the learning experience.
- Reflective learners want a chance to reflect, analyse, deliberate, draw conclusions and, thus, the type of training required involves distance learning, audio and video resources etc.; Reflective learners prefer to think about things quietly first. These are learners who will gain from learning with a DVD as they can watch the recorded material over again, such as interactive media, text, moving visuals and audio clips. Guimaraes *et al.* (2000) state that reflective learners can benefit from the WWW as it is asynchronous and, thus, caters naturally to the needs of these learners.
- Theory learners want models, complexity, rationality and, thus, the type of training required involves electronic inter-activity, models, simulators etc. Guimaraes *et al.* (2000) state that these learners may use text quite readily.

- Sensing learners want to learn facts, are intuitive learners and prefer discovering possibilities and relationships.
- Intuitive learners want innovative challenges and dislike repetition. They grasp new concepts better.
- Sequential learners want to gain understanding in linear steps, with each step following logically from the previous one.
- Visual learners want pictures, diagrams, flow charts, time lines, films, and demonstrations. They remember best what they see. Most lectures are presented in such a way that students need to listen and read off a board. Unfortunately, most people are visual learners and this means that most students do not get nearly as much as they would if more visual presentation were used in class. Thus, the availability and exposure of videotape, CD-ROM or DVD with many descriptive and explanatory visuals, would be good for students.
- Verbal learners want spoken explanations as they get more out of words be it written or spoken. This means that text with an audio recording or audio explanations on its own is beneficial.
- Global learners want to learn in large jumps, absorbing material randomly without seeing connections, and then suddenly "getting it." These learners will benefit from DVD technology as video clips and interactive features will be beneficial to them.

One can, therefore, deduce from above, that the incorporation of multimedia into teaching and learning suits different learning styles, as theory learners, who predominantly use text, will benefit from, for example, multimedia DVDs.

### **3.6.2 Principles to consider when designing multimedia material**

Mayer and Moreno (2000:2) have identified five principles of instructional design that need to be considered when designing multimedia materials. The first two principles are more important for low-knowledge than high-knowledge learners, and for high-spatial learners. (A spatial learner is one who learns better when on-screen text and visual materials are physically integrated rather than separated.) Doolittle (2000) and Mayer and Moreno (2000:2) further describe three principles of instructional design.

- a. The contiguity principle. This principle states that when giving a multimedia explanation corresponding words and pictures should be presented simultaneously rather than separately. This is because students understand explanations better when on-screen text and visual materials are physically integrated rather than separated. This effect is called the contiguity effect and is consistent with the cognitive theory of multimedia learning as corresponding words and pictures must be in short-term memory at the same time so as to ensure easier transfer

links between them. For example, students who read a text explaining how tire pumps work, that included captioned illustrations placed near the text, produced about 75% more useful solutions than students who read the same text and illustrations presented on separate pages. What is important regarding this principle is that one must not separate text from diagrams on a screen, as they must be physically integrated (Mayer & Moreno, 2000:3).

The critique against this principle is that one should replace on-screen text by audio narration as it yields better learning, following the modality principle (cf. 4. below). This, however, cancels out the spatial contiguity principle and so it is recommended that the keywords used in the audio narration should be highlighted as on-screen text, so as to reinforce the narration (Kuomi, 2006:218). The temporal contiguity principle states that students learn better when verbal and visual materials are temporally synchronized rather than separated in time. This means that words and pictures must be presented near rather than far from each other in time (Mayer, 2001:110-112).

b. The split-attention principle. This principle states that when giving a multimedia explanation, words should be present as auditory narration rather than as visual on-screen text. Thus, words should be presented in an auditory channel rather than visually. This is called a split attention effect and is consistent with the cognitive theory of multimedia learning. This is so due to the on-screen text and animation which can overload the visual information processing system whereas narration is processed in the verbal information processing system and animation is processed in the visual information processing system. For example, students who viewed an animation showing the formation of lightning while also listening to a corresponding narration showed 50% more useful solutions to problems than did students who viewed the same animation with corresponding on-screen text consisting of the same words as the narration (Moreno & Mayer (2000). Contemporary principles related to the latter have been produced. According to Wikipedia (2006), visual split-attention principle students learn better, when the instructional material does not require them to split their visual short-term memory between different sources of information (e.g., text and diagrams). Similarly, Moreno (2001:3) states that the auditory split-attention principle students learn better, when extra auditory material, for example, music and irrelevant sounds, are excluded in multimedia explanations. This principle is naturally reasonable. It does, however, imply that audio commentary is always superior to screen text. The only danger with this principle is that the visual attention could become distracted (Kuomi, 2006:216).

c. The coherence principle. This principle states that when giving a multimedia explanation, one should use a small number of irrelevant words and pictures. This is because students learn better from a clear summary, which highlights the relevant words and pictures

than from a longer version of the summary containing extra material. This called the redundancy effect and is consistent with the cognitive theory of multimedia learning as a shorter presentation helps the learner to select relevant information and organize it productively. For example, students who read a passage explaining the steps in how lightning forms along with corresponding illustrations produced 50% more useful solutions than did students who read the same information with additional details placed in the text (Mayer & Moreno, 2000:4). Therefore, one can say that interesting and or irrelevant items are not beneficial to learning.

d. The modality principle states that students learn better when verbal information is presented in an audio fashion for concurrent (both audio and animation at the same time) and sequential presentations (animation with text appearing before or after it). This means that students learn better from, for example, animation and audio narration (concurrently) than from animation and on-screen text (sequentially) (Doolittle, 2000). It is advised by Doolittle (2000) that multimedia presentations involving both words and pictures should be made using auditory or spoken words to accompany the pictures, instead of written text. This principle, therefore, maintains that synergy must be created between the animation and audio narration in concurrent presentations.

e. The redundancy principle states that students learn better from animation and narration than from animation, narration, and on-screen text (Doolittle, 2000) if the visual information is presented simultaneously to the verbal information (Moreno & Mayer, 2000), therefore, assuming that the text is the same as the narration. This means that multimedia presentations involving both words and pictures should present text either in written form, or in auditory form, but not in both (Doolittle, 2000). One must, however, remember that the use of either text or audio is beneficial to learning as it can reduce cognitive overload and highlight important learning material (Kuomi, 2006:218).

f. The multiple representation principle. This principle states that it is better to present an explanation in words and pictures than in words alone. Thus, it is better to explain using two modes of representation rather than one. This is also called the multimedia effect. This means that in staying consistent with the cognitive theory of multimedia learning, students who are given multimedia explanations are able to build two different mental representations. The latter mental representations refer to a verbal model and a visual model, as well as connections between them. Research has shown that students who read a text with captioned illustrations near to the corresponding words come up with about 65% more useful solutions than did students who simply read the text (Mayer & Moreno, 2000:2). This principle leans towards the cognitive theory of multimedia learning and the dual channels assumption (cf. 2.2.3 & 2.2.3.1). This principle is valuable to designers as research by Allan Pavio shows that the ability to

remember is enhanced if both visual and audio materials are presented to the learner (cf. 2.2.3.1).

g. The individual differences principle. This principle states that multimedia effects, contiguity effects and split-attention effects depend on individual differences in the learner. According to Mayer and Moreno (2000:4), the cognitive theory of multimedia learning, students with high prior-knowledge may be able to produce their own mental images while listening to an animation or reading a verbal text so having a contiguous visual presentation is not needed. This is evident where students who scored high on tests of spatial ability showed greater multimedia effects than students who scored low on spatial ability. The cognitive theory of multimedia learning shows further that those students with high spatial ability are able to hold the visual image in visual short-term memory and so are more likely to benefit from a joint presentation of words and pictures. For example, students who lack prior-knowledge tended to show stronger multimedia effects and contiguity effects than students who have high levels of prior-knowledge. Therefore, the individual differences principle states that design effects are stronger for low-knowledge learners than for high-knowledge learners and for high spatial learners rather than from low spatial learners (Doolittle, 2000). Doolittle (2000) states further that the above-mentioned strategies are very effective for low-knowledge learners and visual learners, who are regarded as high-spatial learners. De Westelinck *et al.* (2005:558) state that the cognitive theory of multimedia learning has proved that the design principles for developing learning material does result in higher performance on memorisation and tests where knowledge has to be transferred.

h. The self-reference principle states that students learn better when instructional explanations are provided in a dialogue style that is personalized, rather than a monologue style that is generalized (Doolittle, 2000). This principle can be related to the social agency factor (cf. 3.6.1.5) and may be said to reflect on the learning style of learners who are for example, sequential or verbal learners (cf. 3.6.1.8).

### **3.7 CONCLUSION**

The literature review in this chapter indicates that when one refers to multimedia it means that media such as text, audio, still images, animation and video interactivity are present, and used in a specific format for entertainment and/or education. It has been established that ICT and multimedia can successfully be integrated with many benefits in education, however, infrastructure and connectivity pose a major problem for educational institutions. It has also been established that the design of learning materials must, if it is to be effective, keep the cognitive load of learners at a minimum during the learning process. When designing multimedia, one must bear in mind that various factors must be taken into consideration when dealing with: the use of text, verbal and pictorial representations; cognitive activity; a learner's prior-knowledge, experience and ability levels; social agency; animation; video; and learning styles. There are also eight principles of instructional design that need to be considered when designing multimedia materials, namely the contiguity principle; split-attention principle; coherence principle; modality principle; redundancy principle; multiple representation principle; individual differences principle; and self-reference principle.

## **CHAPTER 4**

### **METHOD OF RESEARCH**

#### **4.1 INTRODUCTION**

In this chapter, the method of research employed in this study is discussed. The following aspects relating to the methodology are discussed, namely the research design, participants, measuring instruments, data collection procedure, intervention, and data analysis as well as the ethical issues with respect to the study.

#### **4.2 METHOD OF RESEARCH**

This section outlines the relevant literature that was reviewed as well as the empirical study.

##### **4.2.1 Literature review**

A wide-ranging literature study was undertaken on themes focussing on ICT in education, cognitive views of learning, and teaching and learning of Geography and History. Databases such as EBSCOHost and ERIC were consulted as well as various primary and secondary sources. Keywords used include: *Information and Communication Technology, Multimedia, Digital Video Disc (DVD), Social Sciences; Humanities, Geography; History; tertiary/higher education; technology; multimedia instruction; teaching and learning; technology education; teaching methods, technological literacy, teacher training.*

##### **4.2.2 Research design**

The research design implemented is a quasi-experimental design (Leedy & Ormrod, 2001:229-232;237,238). Four intact groups were exposed to different experimental treatments/interventions. The four groups acted as their own controls (cf. 4.2.5).

##### **4.2.3 Participants**

The total population of first-year students taking the compulsory module in LASS, who were part of the BEd Intermediated and Senior phase Programme at the NWU (Potchefstroom Campus), were chosen to participate in this study. The total number of bona fide students was 315. The gender distribution was 98 males and 219 females. The distribution of the students in the various groups is shown in Table 4.1 below.

**Table 4.1      The number of students in each group for each assessment opportunity**

| Group name.<br>& total | Test 1  | Test 2    | Test 3               | Test 4                     | Semester<br>Test | Examination |
|------------------------|---------|-----------|----------------------|----------------------------|------------------|-------------|
|                        | Sources | Democracy | Natural<br>Resources | Sustainable<br>Development | Sources          |             |
| E - 70                 | 62      | 50        | 48                   | 47                         | 65               | 63          |
| C - 86                 | 83      | 69        | 67                   | 62                         | 82               | 81          |
| F* - 85                | 4       | 3         | 72                   | 67                         | 76               | 79          |
| D - 74                 | 68      | 59        | 65                   | 61                         | 69               | 71          |

Table 4.1 shows that for each assessment opportunity the total number of students differed. This is attributed to the fact that some students did not write the paper prepared for the assessment opportunity. However, Group F\*'s totals for Test 1 and 2 are only single digit totals due to the data being accidentally discarded.

#### **4.2.4 Measuring instruments**

The measuring instruments chosen for this study included: class tests, a semester test and an examination. The assessment opportunities tested module outcomes. The assessment of the learning outcomes of each study unit in the LASS module, of BEd students at the NWU (Potchefstroom Campus) was, therefore, the statement of intended results of learning and teaching. For this study, the learning outcomes chosen for this first-year-student module tested the mastering of knowledge and application level outcomes, in compliance with the NWU and the South African Qualifications Authority (SAQA).

According to the Government Gazette (SA, 1998:5), SAQA and the National Standards Bodies, assign level descriptors throughout the educational spheres. This is to ensure consistency and to facilitate assessment of the international comparability of standards and qualifications. The level descriptors for the Higher Education and Training band are levels 5 to 8. Level 5 descriptors are applicable to first-year university students. SAQA also states that all qualifications submitted for registration must address critical outcomes of which one is the use of "science and technology effectively and critically" (SA, 1998:6).

According to the Government Gazette (SA, 1998:5), SAQA states further that the "proposers of qualifications", in this case the NWU, must construct learning outcomes with exit level outcomes, which must include knowledge, skills and values, for assessment. The qualifications framework, designed for higher education institutions to develop programmes and qualifications,

forced tertiary institutions to follow set rules regarding assessment and teaching at certain levels so as to comply with the demands of SAQA (CHE, 2004:11,12; NWU, 2007b:1; NWU, 2007c:1.)

According to the Teaching and Learning Policy of the NWU (2007b:2), the teaching staff appointed by a dean must ensure effective delivery of programmes. The development and delivery of programmes may be supported by sensible use of suitable technology. The Teaching and Learning Policy of the NWU (2007b:2) states further that programmes may be delivered by means of a blended mode. This means that face-to-face contact between student and lecturer, distance learner and/or e-learner may take place. The latter was the case with this study in the LASS as explained previously when referring to the use of the portable DVD player. The NWU has also formulated an unofficial document to deal with the assessment of pre-graduate students referring to the weights of cognitive skills.

The Academic Support Services of the NWU has formulated guidelines in the Concept Moderator's Report, for the degree to which levels of learning skills must be tested, on the different university levels (Coetzee-Van Rooy, 2003:7). Certain weights have been placed on low and high order cognitive skills when assessing and teaching pre-graduate students. The weights are an interpretation of the level descriptors and they have been established according to year groups, so as to determine the progressive development of students from the first to fourth year. First year students must master 80 % low order cognitive skills and 20 % high order cognitive skills. The weights change progressively so that in the fourth year 20 % is allocated to low order cognitive skills and 80 % to high order cognitive skills.

This implies that at the NWU teaching and assessment for a specific year group of students is in a relation between low and high order cognitive skills. It is, thus, necessary to investigate low and high order cognitive skills in more detail by referring to Bloom's taxonomy (Bloom, Madaus & Hastings, 1981:331) and the six levels of cognitive skills.

According to Bloom *et al.* (1981:40-42; 331-333), the taxonomy (classification system) of the cognitive domain is arranged in a series from simple to complex. It focuses on the cognitive domain of knowledge, skills and intellectual abilities such as critical thinking. Six basic objectives are listed in Bloom's taxonomy. They are: knowledge, comprehension, application, analysis, synthesis and evaluation. Knowledge is listed as class number one and applications as class three. These help form the foundation for remembering, reasoning, problem-solving, concept formation and creative thinking (Wellington, 2006:24-27). Knowledge and application are the two classes chosen from the six forms in Bloom's taxonomy for this study. The reason for choosing the aforementioned classes was so that a typical first year group of students, some with little prior-knowledge in a relatively unfamiliar learning area, could comply with the

requirements of first-year university students as per Concept Moderator's Report by the Academic Support Services of the NWU (Coetzee-Van Rooy, 2003:7).

According to Bloom *et al.* (1981:331-332), the taxonomy describes the knowledge class as being about remembering and recalling of facts. It means that one can recognise something without necessarily understanding, using or changing it as it involves little more than bringing to mind the appropriate material. It is further subdivided into: knowledge of specifics (terminology, specific facts, etc.); knowledge of ways and means of dealing with specific issues (conversions, trends, sequences, classifications, criteria for testing or judging, etc.); and knowledge of the universals and abstractions in a field (theories used to study phenomena or solve problems, etc.). Application involves using a general concept, which must be remembered and applied. It is not subdivided, but applies abstractions in particular situations whereby the problems are solved using the knowledge acquired.

The yearbook of the NWU's Potchefstroom Campus stipulates that the knowledge, skills and values that students should master in a BEd programme, will demonstrate their ability to fulfil the role of scholar, researcher and lifelong learner (NWU, 2006:25). Therefore, this means that the student must be technologically literate in order to, for example, undertake literature research searches and facilitate learning with the help of ICT. This will further help the student to understand and experience the theories of learning in a diverse and developing country like South Africa first hand. Each student, therefore, received a portable DVD player, as the portal to ICT, with discs to enable him/her to learn with technology.

The measuring instruments chosen for this study include:

- one pre-test
- three class tests,
- one semester test and
- one examination.

#### **4.2.4.1 Pre-test**

The LASS pre-test class test (cf. Addendum A) comprised of multiple-choice questions. The questions in the test assessed outcomes relating to knowledge and application. Students had to answer the multiple-choice questions by choosing the "*one correct item that fits*" from a list of four items or the "*one item that does not fit*" from the choice of four items.

#### **4.2.4.2 Class tests**

The class tests comprised of multiple-choice questions. Two History tests (cf. Addendum B & C) and one Geography class test (Addendum D) was written. Test 1-*Sources* (cf. Addendum B) and Test 2- *Democracy* (cf. Addendum C) refer to the History tests and the major theme assessed in the test. The last test written, namely the Geography test, is referred to as Test 3- *Natural Resources* and Test 4- *Sustainable Development* in the data analysis, but was written as one test (cf. Addendum D). The reason for this is that it was the last test written before the end of the semester covering two themes. This work was presented on the last four DVDs.

The selected questions in each test assessed outcomes relating to knowledge and application. Students had to answer the multiple-choice questions by choosing the “*one correct item that fits*” from a list of four items or the “*one item that does not fit*” from the choice of four items.

#### **4.2.4.3 Semester Test**

The Semester Test (Addendum E) assessed the History outcomes that were also assessed in Test 1. The five questions posed, for the purpose of this study, assessed knowledge and application, which required a written answer from the students.

#### **4.2.4.4 Examination**

The Examination (Addendum F) also assessed both the Geography and History themes respectively that were presented on the DVDs. The questions posed, for the purpose of this study, assessed both knowledge and application, which required multiple-choice responses (Question 1) and a written answer from the students for Questions 2 and 3.

#### **4.2.5 Intervention**

Each group (C, D, E & F) acted twice as the control group and twice as the experimental group. Students who formed part of the control group attended the traditional contact lecture. Students who formed part of the experimental group received a portable DVD player and DVD (DVD 1 or DVD 2). Due to the nature of the Learning Area, as discussed in chapter 3 (cf. 3.5.1), it was necessary to establish a History and a Geography sample component. Two themes were used as the knowledge focus within the History and Geography disciplines, respectively for this study. The other themes were mastered by the students during the scheduled traditional contact lectures. Within the History discipline, group C received DVD 2 and group D received DVD 1, when acting as the experimental group for the *Sources* theme, whilst groups E and F acted as

the control group. For the *Democracy* theme group E received DVD 2 and group F received DVD 1, when acting as the experimental group, whilst groups C and D acted as the control group (cf. Table 4.2).

Within the discipline of Geography group C received DVD 1 and group D received DVD 2, when acting as the experimental group for the *Natural Resources* theme, whilst groups E and F acted as the control group. For the *Sustainable Development* theme group E received DVD 1 and group F received DVD 2, when acting as the experimental group, whilst groups C and D acted as the control group (cf. Table 4.2). This means that for the duration of the study, each student had the same exposure to DVD 1 and DVD 2, and to the traditional contact lecture, within the LASS, when acting as the experimental group and control group, respectively.

As referred to above, the study was taken one step further in that, within both disciplines of the LASS, the student in the experimental group was exposed to the two types of multimedia provided on DVD. DVD 1 always contained text and audio. See Addendum G (DVD 1 *Sources*), Addendum H (DVD 1 *Democracy*), Addendum I (DVD 1 *Natural Resources*) and Addendum J (DVD 1 *Sustainable Development*). DVD 2 always contained a combination of audio, still images with text and video. See Addendum K (DVD 2 *Sources*), Addendum L (DVD 2 *Democracy*), Addendum M (DVD 2 *Natural Resources*) and Addendum N (DVD 2 *Sustainable Development*).

In essence, for the LASS, each student received two multimedia DVDs, one for Geography and one for History together with one portable DVD player (see Addendum O for image) when part of the experimental group. The two DVDs that each student received contained different multimedia. One contained predominantly text with audio (DVD 1) and the other contained still graphics, audio, text and video (DVD 2). Table 4.2 gives an outline of the module planner.

**Table 4.2 Module plan**

| <b>Study Units</b> | <b>Themes</b>                                                                                                                                                                | <b>Geo-graphy (G) or History (H) theme</b> | <b>*DVD &amp; Group</b>                                                   |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|---------------------------------------------------------------------------|
| 1                  | Introduction to the LASS                                                                                                                                                     | G & H                                      |                                                                           |
| 2                  | Humankind's influence on the environment<br>2.1 The functioning of ecosystems<br>2.2 Negative influences on the ecosystems                                                   | G                                          |                                                                           |
| 5                  | Changing Societies<br>5.1 Change and development: European and African societies<br>5.2 <b>Discovering the changes of South Africa's past through sources</b>                | H                                          | DVD1:groupD<br>DVD2:groupC<br>E & F control groups                        |
| <b>Study Units</b> | <b>Themes</b>                                                                                                                                                                | <b>Geo-graphy (G) or History (H) theme</b> |                                                                           |
| 6                  | 6.1 <b>Different forms of government: Twenty-first century Democracy in South Africa as an example of a political ideology</b><br>6.2 Twentieth century political ideologies | H                                          | DVD1:groupF<br>DVD2:groupE<br>C & D control groups                        |
| 7                  | Social Issues of our time                                                                                                                                                    | H                                          |                                                                           |
| 3                  | Earth's Resources<br>3.1 <b>Natural Resources</b><br>3.2 Resources and the location of towns and cities in South Africa                                                      | G                                          | DVD1:groupC<br>DVD2:groupD<br>E & F control groups                        |
| 4                  | <b>Sustainable development</b>                                                                                                                                               | G                                          | DVD1:groupE<br>DVD2:groupF<br>C & D control groups                        |
| TOTAL              | 80 hours of study                                                                                                                                                            |                                            | *DVD 1: text with audio;<br>*DVD 2: still graphics, audio, text and video |

Table 4.2 shows the module plan for the LASW\* 111 (university code \*LASW is the NWU's official module code for the Learning Area Social Sciences, written in Afrikaans and reads as Leerarea Sosiale Wetenskappe.) It is an eight credit module requiring 80 study hours. It also shows the themes that were mastered in the module as well as the order in which they

were presented. The last column shows exactly which group received DVD 1 or DVD 2 and which group acted as the control for each treatment intervention.

#### **4.2.5.1 Materials developed for intervention: Multimedia DVDs**

The excellent capacity for the storage of media, amongst others discussed in Chapter 3, is one reason why the decision was taken at the Potchefstroom Campus of the NWU to use the DVD and DVD player for the study. Another reason for its choice is that, according to Anon (2002:1), the twenty-first century requires teaching strategies, such as DVD-based teaching that uses interactive media to motivate students, so as to keep up with students' active life, stimulate their intellect and it is aimed to accomplish all this within "exemplary instructional design" that will, in South Africa's situation, address OBE.

It was decided for this study, to compare control groups to experimental groups that receive different multimedia DVDs. One, being text with audio (DVD 1) and the other still images, video with text and audio (DVD 2). According to Shepherd (1998:65), any medium that delivers images and text must be an advantage to students learning the subject. A description of the contents of the two DVDs (DVD 1 and DVD 2) handed out to the each student is given below for History and Geography, respectively.

##### **4.2.5.1.1 History DVDs**

Haydn (2000:98) states that the contemporary History classroom is not an ICT filled environment, but teachers do acknowledge that new technology has the potential to enhance teaching in the History classroom. It is interesting to note that Haydn (2000:99) states that a survey revealed that three times as many teachers asked for video recorders rather than computers. This motivates why a DVD containing multimedia is so convenient and versatile as recorded video clips from television can be placed on the DVD to study recent events. This is what was done with some of the History DVDs designed. Haydn (2000:109) states that some History teachers are disappointed with the 'virtual tours' of History museums on the Internet as they only revealed a few pictures which make it time-consuming to adapt for use in the classroom. Bearing the latter in mind it was decided to film one of the DVDs inside a museum, but to show the primary sources as real objects that are not inanimate and move around from room to room to make the experience more tangible.

#### **4.2.5.1.1.1 DVD 1: text with audio (see Addendum G & H)**

This DVD featured the researcher in front of the camera with a Historical backdrop for the introduction. For the theme on *Sources*, the introduction's setting is in a local museum. The motivation for this was to create an atmosphere and to ensure that the sources are made more animate. There are screens of text introducing the theme and the module outcomes for the lecture, which specifically mastered knowledge and application cognition. Both History themes, *Sources* and *Democracy*, have verbal explanations by the researcher and text, accompanied with audio.

#### **4.2.5.1.1.2 DVD 2: still graphics, audio, text and video (see Addendum K & L)**

It was decided for the theme on sources to film the DVD in the museum so that first hand primary sources could be shown. This DVD featured the researcher in front of the camera in a museum and for the theme on *Democracy*, the researcher wore a toga to fit in with the Roman robes of discernment. Screens of text introducing the theme and lecture outcomes are present in both History themes, which specifically focussed on knowledge and application aspects. Verbal explanations by the researcher and text accompanied with audio also feature. There are still images to enable visualisation of the theme as the explanation is given as well as many structured mind maps that set out the theory chronologically and orderly for the *Democracy* theme. Permission was obtained from the etv channel (Addendum P) to show excerpts from their news programme that provided clips of current affairs associated with the theme of *Democracy*. Permission was also obtained from the Council for GeoScience (Addendum Q) to show excerpts from their educational videos that provided clips for the theme *Sources*. Independent video clips from television used for the themes *Sources*, *Democracy*, *Natural Resources*, and *Sustainable Development* did not require special permission since the material became free for public use once it entered the public domain.

#### **4.2.5.1.2 Geography DVDs**

As mentioned in Chapter 3, the use of multimedia technology, within ICT, is very useful in Geography because the discipline is regarded as a highly visual subject (Shepherd, 1998:65). Multimedia is beneficial in the teaching and learning of Geography due to its characteristics (text, numbers, pictures, video and sound as well as information in digital form) and the abundance of geographical images such as maps, photos film, etc. Graphics for teaching elements of Geography is widely accepted and multimedia products together with text enhance learning experiences, and well-designed interactive multimedia can stimulate active learning. The above-mentioned is supported by research revealing that audio-visual resources can be

used effectively to support teaching and learning in Geography education (Shepherd, 1998:61, 65).

#### **4.2.5.1.2.1 DVD 1: text with audio (see Addendum I & J)**

This DVD featured the researcher in front of the camera with a Geographical backdrop. There are screens of text introducing the theme and the module outcomes for the lecture, which specifically focussed on knowledge and application aspects. Both Geography themes, *Natural Resources* and *Sustainable Development*, contain verbal explanations by the researcher and text, accompanied with audio. The *Natural Resources* theme features a statement on the disc, as text, with an answer also given as text, once the correct option (True or False) has been chosen.

#### **4.2.5.1.2.2 DVD 2: still graphics, audio, text and video (see Addendum M & N)**

This DVD featured the researcher in front of the camera with a Geographical backdrop and screens of text introducing the theme and lecture outcomes, which specifically mastered knowledge and application cognition. Both Geography themes, *Natural Resources* and *Sustainable Development*, contain verbal explanations by the researcher and text accompanied with audio. There are still and moving images and maps that visualise the theme as the explanation is given. There is also a statement featured on the disc, as text, with an answer also given as text, once the correct option (True or False) has been chosen. There are also excerpts providing clips of current affairs associated with the theme.

### **4.2.6 Data collection procedure**

Data was collected after each assessment opportunity. During the first phase of the experiment, data was collected and analysed (cf. 4.2.7) from the semester test and class test. During the second phase of the experiment, data was collected and analysed from the class tests and examination. The data analysis was centred on the assessment of the two outcome levels namely: knowledge and application for History and Geography, respectively. The researcher was responsible for data collection. All the students wrote the same test. Test 1 was the only test not written by all four groups at the same time in the same venue. Two groups wrote directly after each other on one day followed by the remaining two groups the following day. Two versions of the same question paper were used for Test 1.

#### 4.2.7 Data analysis

The analysis of the data was processed with the help of the Statistical Consultation Services of the NWU. An analysis of covariance (ANCOVA) was used to analyse the data (Leedy & Ormrod, 2005:274). According to and Leedy and Ormrod (2005:274), the ANCOVA looks for differences among three or more means, controlling for the influence of another continuous variable (in this case the covariate is ability as measured by the pre-test). This is done to test if the means of a number of populations differ from one another. In this way, it compares the variances ( $s^2$ ) within and also across groups, controlling for the covariate.

The ANCOVA was used to compare the averages of more than two groups using statistical calculations, controlling for differences in ability as measured by the pre-test. For each comparison, two outcome levels were used in the assessment namely: knowledge and application for History and Geography respectively, for the comparison of the control group with each experimental group's intervention. The treatment interventions account for the four times that DVDs were handed out for each of the four themes and then compared to the control group.

Statistical significance (p-values), as well as the practical significance (d-values) is reported in the explanation and discussion of the analysed data (Ellis & Steyn, 2003:52-53) for the four groups used in the study that were not equal in size.

The effect size is a measure of practical significance, using Cohen's d-value and was calculated using the formula  $d = \frac{|\bar{x}_i - \bar{x}_j|}{\sqrt{MSE}}$ , 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  $MSE$  the mean square error of the ANCOVA. Guidelines for interpretation are (a) small effect:  $d=0.2$ , medium effect:  $d=0.5$  and (c) large effect:  $d=0.8$ .

#### 4.3 ETHICAL ISSUES

Consent for participation from the Learning Area Department Head, who was also the acting director, was requested (Addendum R) in order to get permission to undertake the study. The acting director granted permission (Addendum S) as the matter was discussed further with the project leader. The obligatory ethics application form from the Office for Research Support – Ethics Committee of Faculty of Educational Sciences at the NWU was submitted and accepted.

#### **4.4 CONCLUSION**

The method of research was outlined in this chapter in order to facilitate possible future replication of a similar study. The research design was a quasi-experimental design. The bona fide participants were exposed to pre-test, class tests, a semester test and an examination as measuring instruments. The material developed for the intervention was two multimedia DVDs. The one contained predominantly text with audio (DVD 1) and the other contained still graphics, audio, text and video (DVD 2). Two were made for History and two for Geography, respectively, for each of the four interventions. The ANCOVA was used as the statistical procedure for the adjustment for the pre-test (ability) results. Each DVD format was designed to facilitate learner-centred learning in the LASS.

## **CHAPTER 5**

### **RESULTS AND DISCUSSION**

#### **5.1 INTRODUCTION**

The aim of the empirical research of this study was to evaluate the influence of two different formats of presentation on DVD, on student outcomes in the LASS. The DVD format, text with audio (DVD 1) (see Addendum G, H, I & J) and multimedia containing text, audio, still and moving graphics with excerpts from television documentaries, etc. (DVD 2) (see Addendum K, L, M & N), was used for first-year pre-service teachers in the LASS, with specific reference to the disciplines of History and Geography. The purpose of this chapter is to present and discuss the analysed data collected during this study. In addition, the purpose is to address the research questions posed in chapter 1 specifically, namely

- What should the structure and format of the multimedia on the DVD look like to achieve selected learning outcomes within the LASS?
- How can one integrate ICT, specifically the DVD, into the teaching and learning of the LASS?

#### **5.2 THE STRUCTURE AND FORMAT OF MULTIMEDIA ON DVD THAT CAN ACHIEVE SELECTED LEARNING OUTCOMES WITHIN THE LASS**

The results for History and Geography teaching and learning are presented and discussed separately due to the separate, but linked nature of the learning area (cf. 3.5.1).

The ANOVA was used as the statistical procedure for the pre-test, using statistical calculations to compare the averages of the four groups (C, D, E & F) used in the study. This was done to test if the means of the four groups differed, from one another in the test written before the student's were subjected to the use of the DVDs for teaching and learning.

Table 5.1 and Figure 5.1 show the mean scores of the pre-test (see Addendum A) results for all four groups for the LASS test, which totaled 30 marks.

**Table 5.1 Pre-test means, pre-test standard deviations and p-value for groups C, D, E & F for LASS**

| C               |                             | D               |                             | E               |                             | F               |                             | p-value |
|-----------------|-----------------------------|-----------------|-----------------------------|-----------------|-----------------------------|-----------------|-----------------------------|---------|
| Pre-test Mean % | Pre-test Standard Deviation | Pre-test Mean % | Pre-test Standard Deviation | Pre-test Mean % | Pre-test Standard Deviation | Pre-test Mean % | Pre-test Standard Deviation |         |
| 16.5            | 4.7                         | 15.0            | 5.2                         | 16.8            | 5.1                         | 15.2            | 4.6                         | 0.0664  |

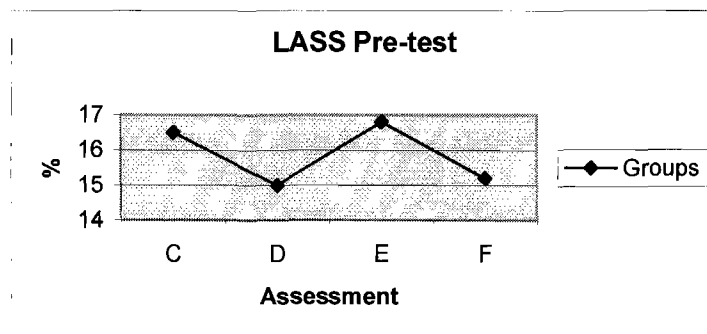


**Figure 5.1 Averages of LASS pre-test assessment**

The mean scores for all four groups yielded no statistical significance among the groups (cf. Table 5.1). The comparisons between the four groups for the pre-test yielded no practical significance, as all the effect sizes were small and not practically significant. All four groups performed fairly the same with means ranging from 15%-16.8% (cf. Table 5.1 and Figure 5.1). Therefore, all four groups are presumed to be comparable.

### **5.2.1 The DVD structure and format for History teaching and learning that can benefit student learning within the LASS**

For the History component of the study, experimental group D was given DVD 1-*Sources* (see Addendum G) containing text and audio and experimental group C was given DVD 2-*Sources* (see Addendum K) containing text, audio, schematic representations, still and moving graphics, excerpts from documentaries, etc. for the *Sources* theme. For the *Democracy* theme, experimental group F was given DVD 1-*Democracy* (see Addendum H) containing text and audio and experimental group E was given DVD 2- *Democracy* (see Addendum L) containing text, audio, schematic representations, still and moving graphics, excerpts from documentaries, etc. The control group received a traditional contact lecture. An adjustment for the pre-test (ability) results was done using the ANCOVA as the statistical procedure. The data analysis is presented in Tables 5.2, 5.3, 5.4, 5.5, 5.6 and 5.7, and Figures 5.2 and 5.3.

### 5.2.1.1 Data analysis of the History theme *Sources*

Table 5.2 and Figure 5.2 show the adjusted mean scores of the control group (E & F), group C (Multimedia-DVD 2) (see Addendum K) and group D (Text-DVD 1) (see Addendum G) for Test 1 and the Semester Test for the Knowledge and Application outcomes in the discipline of History for the theme *Sources*, (see 5.2.1.1.1 & 5.2.1.1.2 for discussion). The effect sizes (d-values) of Knowledge and Application questions answered by students in Test 1 and the Semester Test for the theme *Sources* between the control group and experimental group is shown in Table 5.3, (see 5.2.1.1.1 & 5.2.1.1.2 for discussion). The effect size within each of the three groups is shown in Table 5.4, (see 5.2.1.1.3 for discussion).

**Table 5.2 The adjusted mean scores, mean square errors and p-values of ANCOVA for Test 1 and the Semester Test with reference to Knowledge and Application questions answered in the discipline of History adjusted for the pre-test results**

| History Theme                            | Control group (E & F) | Group C (Multimedia-DVD 2) | Group D (Text-DVD 1) |                   |               |
|------------------------------------------|-----------------------|----------------------------|----------------------|-------------------|---------------|
| <b><i>Sources</i></b>                    | Adjusted Mean %       | Adjusted Mean %            | Adjusted Mean %      | Mean Square Error | p-value       |
| Test 1 Knowledge History                 | 52.5                  | 55                         | 50.7                 | 643.4             | 0.6006        |
| Test 1 <u>Application</u> History        | 51.1                  | 40.8                       | 41.7                 | 583.4             | <b>0.0253</b> |
| Semester Test Knowledge History          | 63                    | 58.6                       | 54.1                 | 624.4             | 0.0593        |
| Semester Test <u>Application</u> History | 67.3                  | 70.1                       | 70.3                 | 505.28            | 0.5508        |

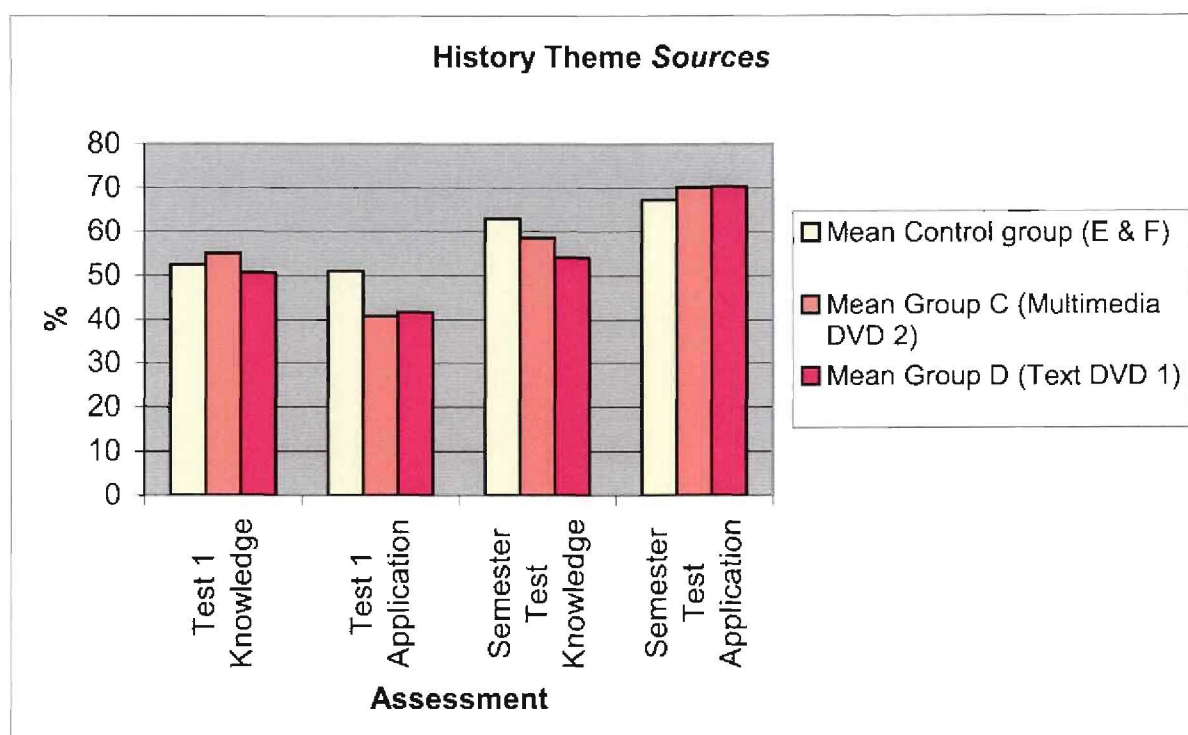


Figure 5.2 Averages of History assessment for the theme *Sources*

Table 5.3 Effect sizes (d-values) of Knowledge and Application questions answered by students in Test 1 and the Semester Test in the discipline of History

| History Theme:<br><b>Sources</b>                      | Group C<br>(Multimedia)<br>&<br>Control group<br>(E & F)<br>d-value | Group D<br>(Text)<br>&<br>Control group<br>(E & F)<br>d-value | Group C<br>(Multimedia)<br>&<br>Group D<br>(Text)<br>d-value |
|-------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|
| Test 1<br><b>Knowledge</b><br>History                 | 0.1                                                                 | 0.1                                                           | 0.2                                                          |
| Test 1<br><b><u>Application</u></b><br>History        | <b>0.4</b>                                                          | <b>0.4</b>                                                    | 0.0                                                          |
| Semester Test<br><b>Knowledge</b><br>History          | 0.2                                                                 | <b>0.4</b>                                                    | 0.2                                                          |
| Semester Test<br><b><u>Application</u></b><br>History | 0.1                                                                 | 0.1                                                           | 0.0                                                          |

#### **5.2.1.1.1 Knowledge outcomes assessed in Test 1 and the Semester Test**

The mean scores for the Knowledge outcome assessed in Test 1 for all three groups yielded no statistically significant difference among the groups (cf. Table 5.2). The comparisons between the three groups for the Knowledge outcome in Test 1 also yielded no practical significance, as the effect sizes were small and not practically significant (cf. Table 5.3). All three groups performed fairly the same with means ranging from 50.7%-55% (cf. Table 5.2 and Figure 5.2). Group C received DVD 2 (see Addendum K) showing the lecturer explaining the work in the museum with on-screen text, and documentary excerpts showing primary and secondary sources. The latter, Group C achieved the best results (55%) followed by the control group (E & F) (52.5%). Group D received DVD 1 (see Addendum G) with text and audio and performed the poorest with 50.7%.

The attainment of the Knowledge outcome on the Semester Test shows that the three groups performed reasonably the same (cf. Figure 5.2) with the control group (E & F) performing the best (63%) (cf. Table 5.2). No statistical significance was obtained (cf. Table 5.2). A visible difference between group D (Text) and the control group (E & F) is shown in Table 5.3.

#### **5.2.1.1.2 Application outcomes assessed in Test 1 and the Semester Test**

With regard to the attainment of Application outcomes in Test 1, the results indicated that the groups differed statistically significantly ( $p$ -value 0.0253). Table 5.2 and Figure 5.2 show how the control group (E & F), who received a traditional lecture, performed visibly better ( $d=0.4$ ) by more than 10%. The control group (E & F) (51.1%) performed better than group D (41.7%) who received DVD 1 (see Addendum G) with audio and text, and they performed better than group C (40.8%) that received DVD 2 (see Addendum K) with on-screen text, graphics and audio showing the lecturer in the museum with examples of primary and secondary sources as well as documentary excerpts. Table 5.3 shows how the effect size for the comparison between the control group (E & F) and group C (Multimedia-DVD 2) and group D (Text-DVD 1), respectively was visible. The statistical significance mentioned above could be because it was the first time that the students were exposed to ICT and multimedia. This was in the form of a portable DVD player with a multimedia disc containing either audio with text (DVD 1-*Sources*) or audio, text, still and moving graphics, documentary excerpts with the lecturer on screen (DVD 2-*Sources*) (cf. 4.2.5.1). It was the first time that the students had to apply their knowledge to answer questions after using DVD 2 with the text, audio, still and moving graphics, etc. and/or DVD 1 with text and audio. The application of this knowledge achieved the best results in a traditional contact session, by more than 10%, possibly because the lecturer was present during the contact session to answer any immediate questions and the lecturer also assessed the students

learning before the end of the lecture, thus, forcing the students to apply their knowledge to the summative questions posed to them immediately after the outcomes were mastered, unlike those students who received the DVDs who had a discussion with the lecturer regarding the theme during the following scheduled time on the roster for the module's contact session. The control group (group E & F) achieved the best results when answering Application outcomes assessed in Test 1.

The mean score for the three groups, for the Application outcome for the Semester Test, did not differ statistically significantly (cf. Table 5.2). The groups' scores fluctuated around an average of 69.2%. Group C (70.1%) (Multimedia-DVD 2) (see Addendum K), who received moving and still graphics with audio and text as well as the documentary excerpts from the Council for Geosciences and group D (70.3%) who only received text and audio performed basically the same. The control group (group E & F) faired the poorest with 67.3% (cf. Table 5.2 and Figure 5.2). The d-value shows a small effect size ( $d=0.1$ ) indicating that the difference between the three groups is not practically significant and not important (cf. Table 5.3).

#### **5.2.1.1.3 Comparison of achievement between Test 1 and the Semester Test of Knowledge and Application outcomes within each group for the theme Sources**

Table 5.4 shows the effect sizes (d-values) of Knowledge and Application outcomes within each of the three groups, between Test 1 and the Semester Test, in the discipline of History for the theme *Sources*.

**Table 5.4 Effect sizes (d-values) of Knowledge and Application questions between Test 1 and the Semester Test within each group in the discipline of History for the theme Sources**

| History Theme:<br><b>Sources</b> | Control group<br>(E & F)<br>d-value | Group C<br>(Multimedia-DVD2)<br>d-value | Group D<br>(Text-DVD1)<br>d-value |
|----------------------------------|-------------------------------------|-----------------------------------------|-----------------------------------|
| <b>Knowledge</b><br>History      | <b>0.4</b>                          | 0.1                                     | 0.1                               |
| <b>Application</b><br>History    | <b>2.1</b>                          | <b>1.7</b>                              | <b>1.7</b>                        |

The effect size of the control group (E & F) ( $d=0.4$ ) for the difference between Test 1 and the Semester Test when assessing Knowledge outcomes is close to medium, showing that a visible difference in the achievement of the control group members exists. The d-value of 2.1 that is greater than 0.8 for the Application outcomes and shows a practically important increase in the achievement of the control group members between Test 1 and the Semester Test and is

practically significant. The reason for the better achievement by the control group (E & F) in both Knowledge and Application outcomes compared to the experimental groups could be because they benefited from the direct contact and interaction with the lecturer. The latter were able to obtain immediate answers to their questions unlike the experimental group that was attended to during the next scheduled contact session. Group C (DVD 2) and group D (DVD 1) have small effect sizes for the Knowledge outcomes meaning that each group's improvement between Test 1 and the Semester Test is not important as it is not practically significant. However, the difference in achievement between Test 1 and the Semester Test for Application outcomes shows a large and significant increase (greater than 0.8) meaning that the difference was practically significant and important for both groups C and D. Reasons for this could be:

- that when assessing Application outcomes some time after receiving a DVD, students who made use of long-term memory to help recall the information of the theme *Sources* performed better, even though the literature states that it is difficult to distinguish between sources when knowledge has to be applied to answer a question (cf. 3.5.2). The reason for the slightly better performance by the DVD group may be due to the recall of information in long-term memory since the DVD group may have facilitated better processing of the information (cf. 2.2.1.1). The literature (cf. 2.2.1.1) does state that when the student is learning and has to interpret information received via the senses, as was the case with the DVDs, what is seen and heard changes according to perception. The information received must be organised into patterns and relationships, which was most likely the case with the groups that received DVDs. This may point to the fact that in History teaching and learning, when answering a question that assesses Application outcomes some time after receiving a lecture, text with audio (DVD 1) (see Addendum G) as well as still and moving graphics with audio (DVD 2) (see Addendum K), the repetition of information with visuals helps to form links between the content and results in better achievement. Table 5.1 and Table 5.3 show how the DVD groups perhaps facilitated the answering of Application outcomes as the students performed better in the Semester Test compared to Test 1.
- found in the literature (cf. 3.5.2) that states the use of primary sources in teaching, generally facilitates the application of knowledge in student learning. DVD 2 *Sources* contained many examples of visual primary and secondary sources, which must have been beneficial to student learning, with the recalling of long-term memory, as the results support it (cf. Table 5.1). The outcome of this study is supported by the literature study (cf. 3.5.2) that also showed how video excerpts were regarded as the most useful teaching and learning aid to help gain knowledge of historical events by helping them to visualise the events in History through resources which they applied to answer the Application outcomes.

### 5.2.1.2 Data analysis of the History theme *Democracy*

Table 5.5 and Figure 5.3 show the mean scores of the control group (C & D), group E (Multimedia-DVD 2) (see Addendum L) and group F (Text-DVD 1) (see Addendum H) for Test 2 and the Examination for the Knowledge and Application outcomes in the discipline of History for the theme *Democracy*, (see 5.2.1.2.1 & 5.2.1.2.2 for discussion). Table 5.6 shows the effect sizes (d-values) of Knowledge and Application questions answered by students in Test 2 and the Examination for the theme *Democracy*, (see 5.2.1.2.1 & 5.2.1.2.2 for discussion). The effect size within each of the three groups is shown in Table 5.7, (see 5.2.1.2.3 for discussion).

**Table 5.5 The adjusted mean scores, mean square errors and p-values of ANCOVA for Test 2 and the Examination with reference to Knowledge and Application questions answered in the discipline of History adjusted for the pre-test results**

| History Theme                          | Control group (C & D) | Group E (Multimedia) | Group F (Text)  |                   |               |
|----------------------------------------|-----------------------|----------------------|-----------------|-------------------|---------------|
| <b><i>Democracy</i></b>                | Adjusted Mean %       | Adjusted Mean %      | Adjusted Mean % | Mean Square Error | p-value       |
| Test 2 Knowledge History               | 49.8                  | 55.8                 | 50.7            | 677.8             | 0.3941        |
| Test 2 <u>Application</u> History      | 59.5                  | 66.5                 | 70.1            | 372.8             | 0.0832        |
| Examination Knowledge History          | 70.4                  | 73.2                 | 70.9            | 847.8             | 0.8475        |
| Examination <u>Application</u> History | 57.8                  | 62.3                 | 47.7            | 524.1             | <b>0.0006</b> |

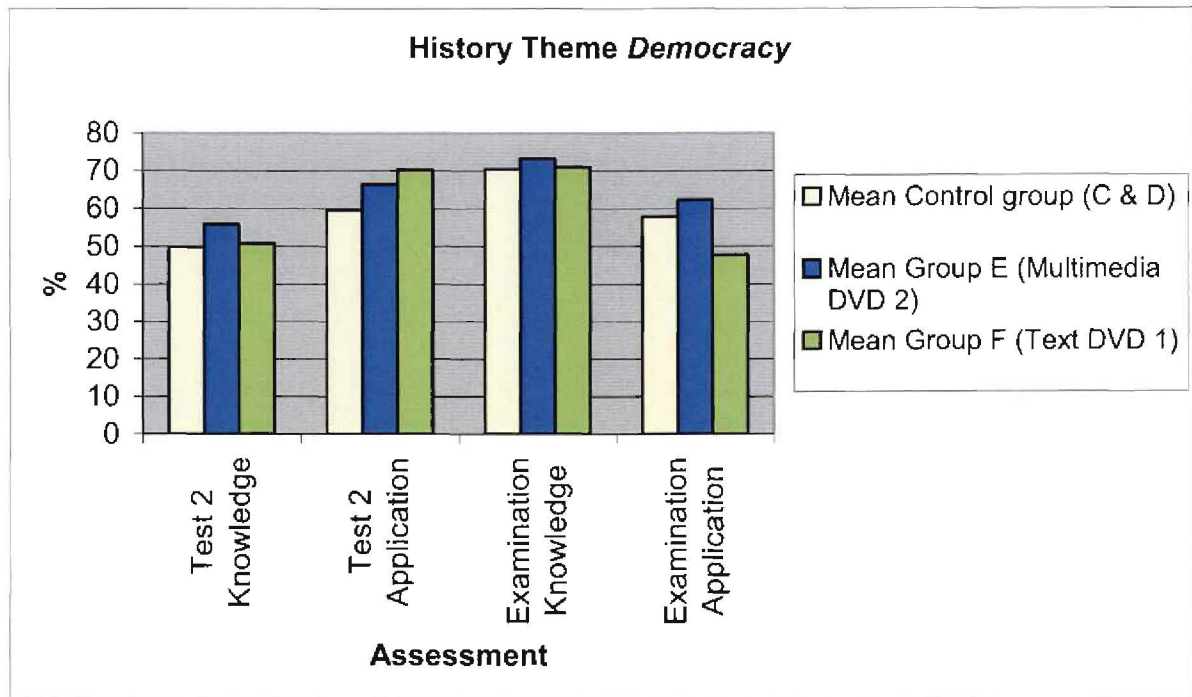


Figure 5.3 Averages of History assessment for the theme *Democracy*

Table 5.6 Effect sizes (d-values) of Knowledge and Application questions answered by students in Test 2 and the Examination in the discipline of History

| History Theme:<br><b><i>Democracy</i></b>           | Group E<br>(Multimedia)<br>&<br>Control group<br>(C & D)<br>d-value | Group F<br>(Text)<br>&<br>Control group<br>(C & D)<br>d-value | Group E<br>(Multimedia)<br>&<br>Group F<br>(Text)<br>d-value |
|-----------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|
| Test 2<br><b>Knowledge</b><br>History               | 0.2                                                                 | 0.0                                                           | 0.2                                                          |
| Test 2<br><b><u>Application</u></b><br>History      | <b>0.4</b>                                                          | <b>0.5</b>                                                    | 0.2                                                          |
| Examination<br><b>Knowledge</b><br>History          | 0.1                                                                 | 0.0                                                           | 0.1                                                          |
| Examination<br><b><u>Application</u></b><br>History | 0.2                                                                 | <b>0.4</b>                                                    | <b>0.6</b>                                                   |

#### 5.2.1.2.1 Knowledge outcomes assessed in Test 2 and the Examination

The mean scores for the Knowledge outcome assessed in Test 2 for all three groups yielded no statistically significant difference among the groups. All three groups performed fairly the same with means ranging from 49.8%-55.8% (cf. Table 5.5 and Figure 5.3). However, group E who

received DVD 2 (Multimedia) (see Addendum L) with text, audio, schematic representations, still and moving graphics with excerpts from the news, performed 6% better than the control group (C & D). In group F, only two students' data was obtained (cf. 4.2.3). The comparisons between the three groups for the Knowledge outcome in Test 2 also yielded no practical significance (cf. Table 5.6) as a small effect size was obtained (0.2) meaning the differences were not practically significant and not important.

The attainment of the Knowledge outcome on the Examination shows that the three groups performed fairly the same (cf. Figure 5.3) with group E (73.2%) who received DVD 2 (Multimedia) (see Addendum L) with text, audio, schematic representations, still and moving graphics with excerpts from the news, performing better than the control group (C & D) (70.4%) and Group F (70.9%) who received text with audio (see Addendum H). No statistical significance (cf. Table 5.5) and no practical significance were obtained among the groups, meaning that the differences were not practically significant and not important (cf. Table 5.6).

#### **5.2.1.2.2 Application outcomes assessed in Test 2 and the Examination**

Table 5.5 shows no statistical significant difference ( $p$ -value 0.0832) in the mean scores of group E (Multimedia) (see Addendum L), group F (Text) (see Addendum H) and the control group (C & D), for the Application outcome of Test 2. Table 5.5 and Figure 5.3 show how the control group (C & D), who received a traditional lecture (59.5%), performed poorer, compared to Group E (66.5%) who received DVD 2 containing the text, audio, schematic representations, still and moving graphics with excerpts from the news, etc. Table 5.6 shows how the effect size for the comparison between the control group (C & D) and group E (Multimedia-DVD 2) yielded a visible effected size of  $d=0.4$ . The comparison between group F (Text) and the control group (C & D) yielded a medium effect of  $d=0.5$ . The comparison between Group E (Multimedia-DVD 2) and group F (Text-DVD 1), showed a small effect size of  $d=0.2$ . However, cognizance must be taken of group F who only had two students (cf. 4.2.3). The reason for the best performance between group E and the control group (C & D) is possibly because DVD 2 contained clear schematic representations of the different characteristics of democracy as well as contemporary examples from the political state of affairs in the country that were used from news programmes to explain the work, which may have helped make the theme more educational and easier to associate the theory with the practical. The literature study (cf. 3.5.2) showed how History students rated video as the most useful teaching and learning aid helping them gain knowledge of historical events presented in the resources, helping them to visualise the events. In this case, DVD 2's (see Addendum L) content helped the students to visualise the different types of primary and secondary sources and perform practically significantly (cf. Table 5.6) differently from the control group. Another reason for this could be that the students were drawn to the

lecture from the museum on DVD 2 (see Addendum L), finding it interesting and educational. This means that experimental group E, who received DVD 2 (see Addendum L), performed visibly better when compared to the control group (C & D), when Application outcomes were assessed in Test 2.

The mean scores of the three groups for the Application outcome for the Examination indicate that the groups differed statistically significantly (cf. Table 5.5). The mean score of group E (62.3%) that received the still and moving graphics, documentary excerpts, etc. (see Addendum L), was higher than the control group (C & D) (57.8%), and group F (47.7%) (see Addendum H) fared the poorest after receiving only text with audio. The comparison between Group F (that only received text and audio) and the control group (C & D) that received the traditional lecture showed a visible difference of  $d=0.4$  between the two groups. A visible effect size of  $d=0.6$  for the comparison between Group E (that received all the still and moving graphics together with audio and text, etc.) and Group F (that only received text and audio), means that Group E performed visibly better than group E (cf. Table 5.6). The reasons for experimental group E, who received DVD 2 (see Addendum L) containing text, audio, schematic representations, still and moving graphics with excerpts from documentaries, performing the best when compared to the control group and experimental group F when Application outcomes were assessed during the Examination may be:

- the visuals used on DVD 2 (Multimedia), provided a clear schematic outlay of the important components of the theme that had to be mastered in the outcomes and so the concepts were understood easily. This is also mentioned in the literature (cf. 3.5.2) which states that digital historical resources as opposed to print resources made that university students returned to the same documents time and again and that these students had a better understanding of the interrelatedness of the work when using these resources. This means that it is most likely that group E watched the multimedia DVD over again and benefited from the clips and schematic diagrams.
- that History learners rated visual media with video, and other visuals as most useful since it helped them visualise events (cf. 3.5.2). This, therefore, holds true for DVD 2 (multimedia), as the documentary excerpt and visual sources used for the *Democracy* theme has, according to the analysed data, benefited the students.
- that students may be opposed to reading text as they are more accustomed to technological experiences in the web-based world we live in today (cf. 3.5.2). This may explain why Application questions showed higher means for group E (multimedia DVD) when compared to the other two groups.
- the outcome of the Examination showed a slightly poorer achievement by the control group (C & D) when compared to group E. This can be attributed to the long time lapse between the lecture and writing the Examination. This may also be attributed to the fact

that literature shows that short-term memory is not permanent, and if it is not attended to quickly and not enough rehearsal takes place, the information tends to fade (cf. 2.2.1.1).

#### 5.2.1.2.3 Comparison of achievement between Test 2 and the Examination of Knowledge and Application outcomes within each group for the theme *Democracy*

Table 5.7 shows the effect sizes (d-values) of Knowledge and Application outcomes within each of the three groups, between Test 2 and the Examination, in the discipline of History for the theme *Democracy*.

**Table 5.7** Effect sizes (d-values) of Knowledge and Application questions between Test 2 and the Examination within each group in the discipline of History for the theme *Democracy*

| History Theme:<br><i>Democracy</i> | Control group<br>(C & D)<br>d-value | Group E<br>(Multimedia-DVD2)<br>d-value | Group F<br>(Text-DVD1)<br>d-value |
|------------------------------------|-------------------------------------|-----------------------------------------|-----------------------------------|
| <b>Knowledge</b><br>History        | 1.1                                 | 0.9                                     | 1.0                               |
| <b>Application</b><br>History      | 0.1                                 | 0.2                                     | 1.0                               |

All the students' achievement in Knowledge outcomes improved practically significantly (Table 5.7) in all three groups. However, when referring to the large (1.0) effect size one must remember that in Test 2, group F consisted of two students. The effect size for the Application outcomes for the control group (C & D) and Group E are small and not practically significant, therefore, they are not important. Table 5.7 shows how Group F (Text-DVD 1) seems to have an important effect, however, group F's data does not represent the whole group in Test 2. It must be noted that due to the accidental discarding of the majority of Group F's Test 2 results (cf. 4.2.3) the data above may be ambiguous as the data only represents the achievement of only two students for Test 2.

#### 5.2.1.3 General overview analysis of the History themes *Sources* and *Democracy*

The comparison of the averages of all the assessment opportunities, show that the students who received traditional contact lectures and those who used ICT and multimedia technology for teaching and learning, in the discipline of History (Table 5.2 & 5.5), performed in general, the same with minimal differences. In general, the analyses of the theme *Sources* shows that despite no difference in student achievement was obtained between the experimental groups

and control group, the traditional contact lecture yielded better results when assessing Application outcomes in a Test (cf. Table 5.2). ICT, specifically the DVD, can be integrated into LASS when teaching and learning the theme Democracy as groups E's students achieved greater academic results because of DVD 2 containing text, audio, still and moving graphics, documentary excerpts, etc. that contributed to their better performance after assessing Application outcomes. Due to Group F not having all its group results available for Test 2 its results may be ambiguous when this group was the experimental group for the theme *Democracy* (cf. 5.2.1.2). The above shows that in History teaching and learning when assessing Application outcomes achievement is theme specific, and dependent on whether students are taught and learn in a traditional contact lecture or with the aid of a DVD with a specific structure and format of multimedia.

## **5.2.2 The DVD structure and format for Geography teaching and learning that can benefit student learning within the LASS**

For the Geography component of the study, experimental group C was given DVD 1-*Natural Resources* (see Addendum I) containing text and audio and experimental group D was given DVD 2-*Natural Resources* (see Addendum M) containing text, audio, schematic representations, still and moving graphics, excerpts from documentaries, etc. for the *Natural Resources* theme. For the *Sustainable Development* theme, experimental group E was given DVD 1-*Sustainable Development* (see Addendum J) containing text and audio and experimental group F was given DVD 2-*Sustainable Development* (see Addendum N) containing text, audio, schematic representations, still and moving graphics, excerpts from documentaries, etc. The control group received a traditional contact lecture. An adjustment for the pre-test (ability) results was done using the ANCOVA as the statistical procedure. The data analysis is presented in Tables 5.8, 5.9, 5.10, 5.11, 5.12, and 5.13, and Figures 5.4 and 5.5.

### **5.2.2.1 Data analysis of the Geography theme *Natural Resources***

Table 5.8 and Figure 5.4 show the adjusted mean scores of the control group (E & F), group C (Text-DVD 1) (see Addendum I) and group D (Multimedia-DVD 2) (see Addendum M) for Test 3 and the Examination for the Knowledge and Application outcomes in the discipline of Geography for the theme *Natural Resources*, (see 5.2.2.1.1 & 5.2.2.1.2 for discussion). Table 5.9 shows the effect sizes (d-values) of Knowledge and Application questions answered by students in Test 3 and the Examination for the theme *Natural Resources*, (see 5.2.2.1.1 & 5.2.2.1.2 for discussion). The effect size within each of the three groups is shown in Table 5.10, (see 5.2.2.1.3 for discussion).

**Table 5.8** The adjusted mean scores, mean square errors and p-values of ANCOVA for Test 3 and the Examination with reference to Knowledge and Application questions answered in the discipline of Geography adjusted for the pre-test results

| Geographical Theme                              | Control group (E & F) | Group C (Text)  | Group D (Multimedia) |                   |               |
|-------------------------------------------------|-----------------------|-----------------|----------------------|-------------------|---------------|
| <b><i>Natural resources</i></b>                 | Adjusted Mean %       | Adjusted Mean % | Adjusted Mean %      | Mean Square Error | p-value       |
| Test 3 Knowledge Geography                      | 70.1                  | 65.8            | 66.1                 | 331.8             | 0.2028        |
| Test 3 <b><u>Application</u></b> Geography      | 82                    | 78.1            | 79.3                 | 590.4             | 0.5902        |
| Examination Knowledge Geography                 | 93.3                  | 84.2            | 88.3                 | 286.1             | <b>0.0009</b> |
| Examination <b><u>Application</u></b> Geography | 52.3                  | 53.2            | 63.9                 | 493.4             | <b>0.0018</b> |

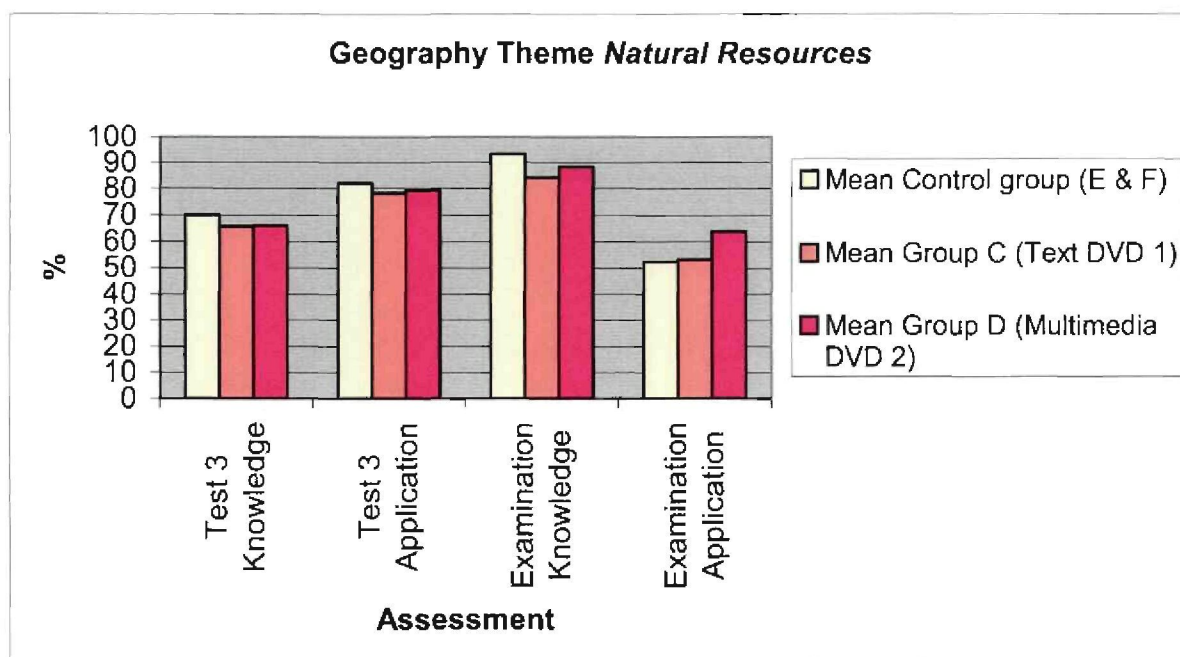


**Figure 5.4** Averages of Geography assessment for the theme *Natural Resources*

**Table 5.9 Effect sizes (d-values) of Knowledge and Application questions answered by students in Test 3 and the Examination in the discipline of Geography**

| Geographical Theme:<br><b><i>Natural Resources</i></b> | Group C<br>(Text)<br>&<br>Control group<br>(E & F)<br>d-value | Group D<br>(Multimedia)<br>&<br>Control group<br>(E & F)<br>d-value | Group D<br>(Multimedia)<br>&<br>Group C<br>(Text)<br>d-value |
|--------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------------|
| Test 3<br><b>Knowledge</b><br>Geography                | 0.2                                                           | 0.2                                                                 | 0.0                                                          |
| Test 3<br><b><u>Application</u></b><br>Geography       | 0.2                                                           | 0.1                                                                 | 0.0                                                          |
| Examination<br><b>Knowledge</b><br>Geography           | <b>0.5</b>                                                    | 0.3                                                                 | 0.2                                                          |
| Examination<br><b><u>Application</u></b><br>Geography  | 0.0                                                           | <b>0.5</b>                                                          | <b>0.5</b>                                                   |

#### **5.2.2.1.1 Knowledge outcomes assessed in Test 3 and the Examination**

The mean scores for the Knowledge outcome assessed in Test 3 for all three groups yielded no statistically significant difference among the groups (cf. Table 5.8). All three groups performed fairly the same with means ranging from 65.8%-70.1% (cf. Table 5.8 and Figure 5.4). The comparisons between the three groups for the Knowledge outcome in Test 3 also yielded no practical significance as the effect sizes were small and not practically significant (cf. Table 5.9). The control group (E & F) performed the best (70.1%) followed by group D (66.1%) who received DVD 2 (see Addendum M) containing still and moving pictures, graphic representations, documentary excerpts, etc. and group C who received DVD 1 (see Addendum I) with text and audio achieving 65.8%, performing the poorest.

The Knowledge outcome for the Examination shows how the three groups performed reasonably the same with means ranging from 84.2%-93.3%. The control group (E & F) performed the best (93.3%) (cf. Figure 5.4). The results indicate that the groups differed statistically significantly (cf. Table 5.8). The comparisons between the control group (E & F) and the experimental groups (groups C & D), respectively yielded (cf. Table 5.9) a medium effect size (0.5) and a small effect size (0.3) meaning that the control group was visibly better than group C. The reason for the statistical significant difference mentioned above could be twofold. The control group (E & F) performed better than the experimental groups (D & C) because the literature states that in oral presentations, in this case the contact session lecture, produce superior learning to audio and text (cf. 3.4.2). The other possibility, as stated by researchers, is that by stopping at certain points, during the contact lecture, and quizzing the students on the

spur of the moment, thus, testing their learning, is beneficial to learning. This is called corrective feedback (cf. 3.6.1.3). It gives a learner more opportunities to learn and so produce a more effective learning experience. This, therefore, shows that in Geography teaching, for the theme *Natural Resources*, contact lectures can be superior to a text and audio, as well as text, audio, still and moving graphics, etc. on DVD when teaching and learning so as to master Knowledge outcomes.

#### **5.2.2.1.2 Application outcomes assessed in Test 3 and the Examination**

Table 5.8 shows that no statistical significance was obtained for Test 3 among the three groups with regard to the attainment of Application outcomes. Table 5.8 and Figure 5.4 show how the control group (E & F) who received a traditional lecture, performed better (82%) than group C (78.1%) that received DVD 1 (see Addendum I) with on-screen text and audio when answering Application outcomes. Referring to the latter, Table 5.9 shows how the effect size for the comparison between the control group (E & F) and group D (Multimedia-DVD 2), was small  $d=0.1$ . This means it was not practically significant and not important. The control group also performed better than group D (79.3%) who received DVD 2 (see Addendum M) with audio, still and moving graphics, text, and schematic representations, showing the student visually the different natural resources found both nationally and internationally. The fact that all three groups showed basically no major difference in their average achievement means that when dealing with the theme of *Natural Resources* high marks are achieved irrespective of the method of teaching and learning when mastering Application outcomes. The literature (cf. 3.4.2) reveals that research undertaken during the 1970s which, compared visuals to text using university students, found no significant difference exists between learning from visual or text presentations. The study by Nugent in 1982 (cf. 3.4.2) showed similarly that when content was the same in visual, audio and text media learning yielded the same results from all types of media respectively, but when the visuals were combined with text or audio, learning was generally maximized.

The mean scores of the three groups for the Application outcome for the Examination differed statistically significantly (cf. Table 5.8). Group D (Multimedia-DVD 2) (see Addendum M) who received moving and still graphics with audio and text as well as excerpts showing natural resources, performed the best (63.9%), followed by group C who only received text and audio (53.9%) (see Addendum I) and the control group (group E & F) who fared the poorest (52.9%) (cf. Table 5.8 and Figure 5.4). Table 5.9 shows a medium effect size of  $d=0.5$  between both group D and group C, and between group D and the control group (E & F) meaning group D performed visibly better than both groups C and the control (cf. Table 5.9). Regarding the statistical significance of the difference among the three groups mentioned in the data analysis

above, the reason for the higher means yielded by group D (Multimedia-DVD 2) (see Addendum M) on Application outcomes during the Examination, for the theme *Natural Resources*, may be due to student learning being enhanced by visual material as discussed in the literature (cf. 3.4.2). This is despite the multimedia DVD being viewed some time before the Examination. Group D received a DVD containing moving graphics with explanations and many examples of the types of *Natural Resources* and their processes in the form of tangible picture illustrations (cf. 3.5.3). It means, as is stated in the literature, that when designing a multimedia DVD, as the case was with DVD 2 *Natural Resources*, the type of resources, for example, both text and pictures invoke deep learning as the learners develop both verbal and pictorial mental, representations and connections between them, resulting in better performance during assessment (cf. 3.6.1.2) and is discussed in the cognitive theory of multimedia learning with regard to the visual/pictorial channels of information processing (cf. 2.2.3). The literature also confirms that a study undertaken at a tertiary institution also revealed that students learn more deeply from multimedia explanations than from a verbal explanation that involves words and visuals than words alone (cf. 3.4.2).

#### 5.2.2.1.3 Comparison of achievement between Test 3 and the Examination of Knowledge and Application outcomes within each group for the theme *Natural Resources*

Table 5.10 shows the effect sizes (d-values) of Knowledge and Application outcomes within each of the three groups, between Test 3 and the Examination, in the discipline of Geography for the theme *Natural Resources*.

**Table 5.10 Effect sizes (d-values) of Knowledge and Application questions between Test 3 and the Examination within each group in the discipline of Geography for the theme *Natural Resources***

| History Theme:<br><i>Natural Resources</i> | Control group<br>(E & F)<br>d-value | Group C<br>(Text-DVD1)<br>d-value | Group D<br>(Multimedia-DVD2)<br>d-value |
|--------------------------------------------|-------------------------------------|-----------------------------------|-----------------------------------------|
| <b>Knowledge</b><br>Geography              | <b>1.3</b>                          | <b>1.0</b>                        | <b>0.7</b>                              |
| <b>Application</b><br>Geography            | <b>1.2</b>                          | <b>1.0</b>                        | <b>0.6</b>                              |

All the students' achievement in the Knowledge outcomes improved practically significantly (cf. Table 5.10) for group C (Text-DVD 1), group D (Multimedia-DVD 2) and the control group (E & F) meaning the difference was important, as the effect sizes were approximately 0.8 or larger. Group C and control group (E & F) decreased practically importantly for the Application outcomes, while group D decreased visibly (effect size of d=0.6).

### 5.2.2.2 Data analysis of the Geography theme *Sustainable Development*

Table 5.11 and Figure 5.5 show the mean scores of the control group (C & D), group E (Text-DVD 1) (see Addendum J) and group F (Multimedia-DVD 2) (see Addendum N) for Test 4 and the Examination for the Knowledge and Application outcomes in the discipline of Geography for the theme *Sustainable Development*, (see 5.2.2.2.1 & 5.2.2.2.2 for discussion). Table 5.12 shows the effect sizes (d-values) of Knowledge and Application questions answered by students in Test 4 and the Examination for the theme *Sustainable Development*, (see 5.2.2.2.1 & 5.2.2.2.2 for discussion). The effect size within each of the three groups is shown in Table 5.13, (see 5.2.2.2.3 for discussion).

**Table 5.11 The adjusted mean scores, mean square errors and p-values of ANCOVA for Test 4 and the Examination with reference to Knowledge and Application questions answered in the discipline of Geography adjusted for the pre-test results**

| Geographical Theme                       | Control group (C & D) | Group E (Text)  | Group F (Multimedia) |                   |               |
|------------------------------------------|-----------------------|-----------------|----------------------|-------------------|---------------|
| <b><i>Sustainable Development</i></b>    | Adjusted Mean %       | Adjusted Mean % | Adjusted Mean %      | Mean Square Error | p-value       |
| Test 4 Knowledge Geography               | 71.4                  | 78.4            | 67.1                 | 577.5             | 0.0578        |
| Test 4 <u>Application</u> Geography      | 83                    | 86.9            | 84.7                 | 541.9             | 0.6176        |
| Examination Knowledge Geography          | 56.4                  | 49.7            | 46.9                 | 508.1             | <b>0.0291</b> |
| Examination <u>Application</u> Geography | 53                    | 56.2            | 47.1                 | 479               | <b>0.0496</b> |

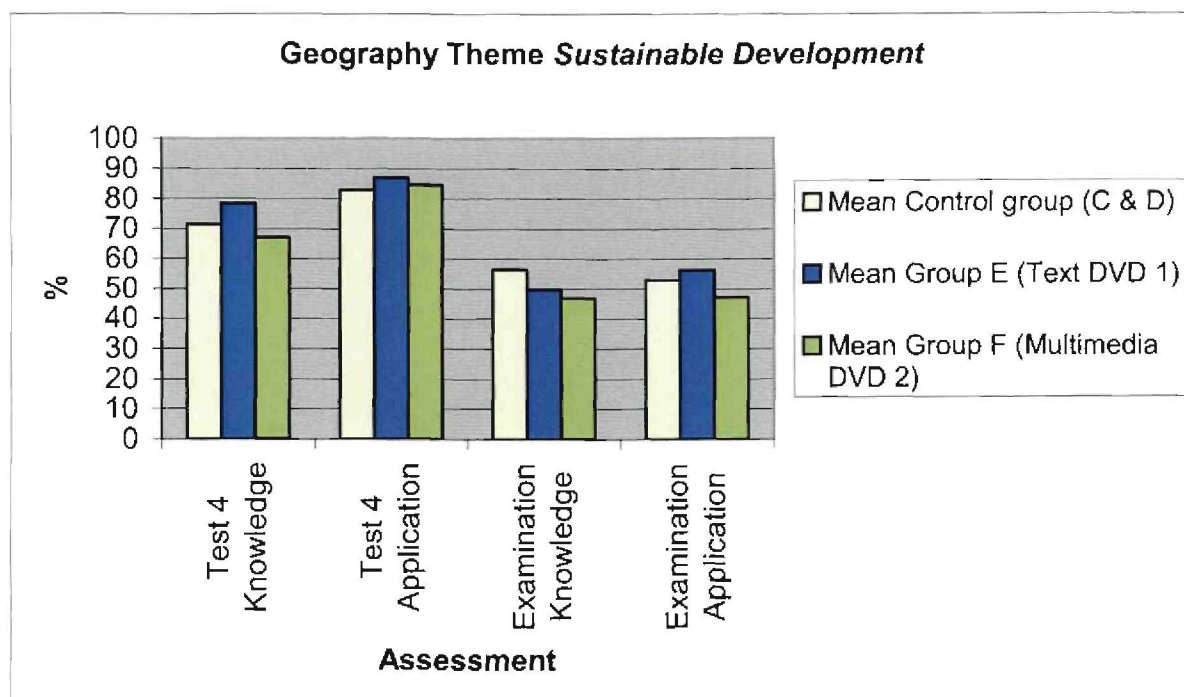


**Figure 5.5** Averages of Geography assessment for the theme *Sustainable Development*

**Table 5.12** Effect sizes (d-values) of Knowledge and Application questions answered by students in Test 4 and the Examination in the discipline of Geography

| Geographical Theme: <b><i>Sustainable development</i></b> | Group E (Text) & Control group (C & D) d-value | Group F (Multimedia) & Control group (C & D) d-value | Group F (Multimedia) & Group E (Text) d-value |
|-----------------------------------------------------------|------------------------------------------------|------------------------------------------------------|-----------------------------------------------|
| Test 4 <b>Knowledge</b> Geography                         | 0.3                                            | 0.2                                                  | <b>0.5</b>                                    |
| Test 4 <b>Application</b> Geography                       | 0.2                                            | 0.1                                                  | 0.1                                           |
| Examination <b>Knowledge</b> Geography                    | 0.3                                            | <b>0.4</b>                                           | 0.1                                           |
| Examination <b>Application</b> Geography                  | 0.1                                            | 0.3                                                  | <b>0.4</b>                                    |

#### **5.2.2.2.1 Knowledge outcomes assessed in Test 4 and the Examination**

The mean scores of the three groups for the Knowledge outcome assessed in Test 4 showed no statistically significant difference ( $p=0.0578$ ) among the three groups (cf. Table 5.11). A small effect size of  $d=0.3$  is seen between group E and the control group (C & D) (cf. Table 5.12). A medium effect size of  $d=0.5$ , is seen in Table 5.12, when referring to the comparison of the means between group F (see Addendum N) that received DVD 2 containing text, audio, schematic representations, still and moving graphics with excerpts from documentaries and group E (see Addendum J) that received DVD 1 with text and audio. Group E (DVD 1) performed the best (78.4%), followed by the control group (C & D) (71.4%) and then group F that received all the text, audio, schematic representations, still and moving graphics with excerpts from the news as the poorest (67.1%) (cf. Figure 5.5 & Table 5.11).

The Knowledge outcome for the Examination shows that the control group (C & D) performed the best (56.4%) (cf. Table 5.11). Group F that received the DVD 2 (see Addendum N) containing text, audio, schematic representations, still and moving graphics with excerpts from documentaries, obtained the poorest mean (46.9%). The data shows that statistical significance (cf. Table 5.11) was obtained. A visible effect size of  $d=0.4$  was obtained (cf. Table 5.12) for the comparison between the control group (C & D) and group F and a small effect size of  $d=0.3$  was obtained for the comparison between group E and the control group (C & D) respectively. Control group (C & D) (56.4%) achieved a higher mean than group F (46.9%) (Multimedia) (cf. Table 5.11) during the examination when answering Knowledge questions. This can be referred back to the same motivation given for the same occurrence in the *Natural Resources* theme where corrective feedback can be said to be a reason for this outcome (cf. 3.6.13). This means that due to the complex nature of the concept in this theme of Sustainable Development, the presence of a lecturer and the use of text as two different teaching methods are more beneficial to student teaching and learning compared to the use of visual graphics, etc.

#### **5.2.2.2.2 Application outcomes assessed in Test 4 and the Examination**

With regard to the attainment of Application outcomes, the results indicated that no statistical significance was obtained for Test 4 among the groups who showed no great difference in the mean scores among the three groups with means ranging from 83%-86.9% (cf. Table 5.11). Table 5.11 and Figure 5.5 show how all three groups performed on average the same with group E (DVD 1 Text) (see Addendum J) who received DVD 1 containing the text and audio performing the best (86.9%) and the control group (C & D) the poorest (83%). No practical

significance was obtained among the groups as the effect size was 0.2 and smaller (Table 5.12) meaning the differences were not practically significant and not important.

The Application outcome for the Examination shows that group E who received DVD 1 with text and audio (see Addendum J) performed the best (56.2%) and group F who received DVD 2 (see Addendum N) with still and moving graphics, text, documentary excerpts, etc. obtained the poorest means (47.1%). Table 5.11 also shows a statistical significant difference in the mean scores of the three groups for the Application outcomes in the Examination. Table 5.12 shows that there is a small effect between the control group (C & D) and group F and group E, respectively. This means that there is no practical significance and that it is not meaningful (cf. Table 5.12). A visible effect size of  $d=0.4$  between group F (Multimedia) and group E (Text) also shows that group E performed visibly better than group F in the Application outcomes in the Examination. It is important to discuss reasons for the statistical significance (cf. Table 5.11) between group E and group F when answering Application questions, where group E (DVD 1 Text) had a greater mean. According to studies by Nugent (cf. 3.4.2), the multimedia visuals may have offered too many elements for encoding the information, and the visuals might have lacked the ability to focus information deeply, something that text and audio do well. The fact that the literature has shown that students tend to only scan through large volumes of multimedia material, enjoying the visual presentation, without any significant learning taking place (cf. 3.5.3), may be a reason why the students using DVD 2 containing different multimedia performed poorer than the other two groups. This means that in order to achieve the best means for the Geography theme *Sustainable Development*, when assessing Application outcomes during an Examination, a DVD containing text with audio will lead to the best results if used for teaching and learning.

This means, as stated clearly in the literature (cf. 3.4.2), that text is more advantageous when the material becomes more complex. In this case, *Sustainable Development* is a complex concept that needs to be understood in order to master its outcomes. Text is regarded, in the literature as having an important advantage for the presentation of complex materials. The literature also refers to text and audio as being superior to audio alone when learning (cf. 3.4.2). Further explanations for the statistically significant difference ( $p=0.0496$ ) between group E (Text), group F (Multimedia) and the control group (C & D) (cf. Table 5.11), despite it not being practically significant when answering Application questions in the Examination, are:

- the Geography theme of *Sustainable Development* differs from the theme of Natural Resources. The latter requires the use of many examples and visuals to teach the theme and so master the outcomes. *Sustainable Development* is a noun, which requires one to understand the concept of economic development with minimum harm and

pollution to the environment meaning that the students might have struggled more to understand the latter theme.

- that learners performed better, when the words were presented in conversational style that was more personalized rather than a detailed descriptive style (cf. 2.2.3.3), and by a character that is personally involved in their learning, like the lecture in this case (cf. 3.6.1.5), as was the case with DVD 1 (Text). The use of DVD 1 (Text) for this theme showed better results as literature states that text has an important advantage for the presentation of complex materials and research also showed an advantage for text, attributed to content differences. Therefore, literature proves that a subject, with its unique characteristics, influences the success of learning via picture or audio presentations. It is also then most likely the case with text, as was the case here (cf. 3.4.1).
- that the students of group E may be theory or verbal learners who learn better with text and found that the spoken explanations on DVD 1 were more helpful (cf. 3.6.1.8) when answering the Knowledge questions. It may also be that the students of group E are used to learning in a certain environment namely: with text and audio.
- that students with high prior-knowledge may be able to produce their own mental images while reading a verbal text may be another reason for the better achievement by students from group E who received DVD 1 (Text) compared to those who received DVD 2 (Multimedia) (cf. 3.6.11 & 3.6.1.4).

#### **5.2.2.2.3 Comparison of achievement between Test 4 and the Examination of Knowledge and Application outcomes within each group for the theme *Sustainable Development***

Table 5.13 shows the effect sizes (d-values) of Knowledge and Application outcomes within each of the three groups, between Test 4 and the Examination, in the discipline of Geography for the theme *Sustainable Development*.

**Table 5.13** Effect sizes (d-values) of Knowledge and Application questions between Test 4 and the Examination within each group in the discipline of Geography for the theme *Sustainable Development*

| History Theme:<br><i><b>Sustainable Development</b></i> | Control group<br>(C & D)<br>d-value | Group E<br>(Text-DVD1)<br>d-value | Group F<br>(Multimedia-<br>DVD2)<br>d-value |
|---------------------------------------------------------|-------------------------------------|-----------------------------------|---------------------------------------------|
| <b>Knowledge</b><br>Geography                           | <b>0.6</b>                          | <b>1.2</b>                        | <b>0.7</b>                                  |
| <b>Application</b><br>Geography                         | <b>1.3</b>                          | <b>1.3</b>                        | <b>1.6</b>                                  |

All the students' achievement in the Knowledge outcomes in the control group (C & D) improved visibly ( $d=0.6$ ) and in group F there was an important decrease showed by the effect size of  $d=0.7$ . Group E showed a practically significant decrease meaning it was important (cf. Table 5.13). All the students' achievement in the Applications outcomes was greater than 0.8 meaning that their differences were practically significantly lower in the Examination.

#### **5.2.2.3** General overview analysis of the Geography themes *Natural Resources* and *Sustainable Development*

A drop in the adjusted mean scores from Test 4 to the Examination in both Knowledge and Application is seen in Table 5.11 for the theme *Sustainable Development*. The drop in the mean scores for the theme *Natural Resources* from Test 3 to the Examination in Application outcomes, may be attributed to the fact that when it comes to the assessment of knowledge that has to be applied, information was not rehearsed elaborately so as to ensure that it was moved to long-term memory (cf. 2.2.1.1). The improved Knowledge mean scores obtained during the Examination for the theme *Natural Resources*, compared to Application may be attributed to the fact that the students relied on long-term memory as the Examination was written after a longer time span, after exposure to the lecture on DVD and traditional contact lecture. It may also mean that since knowledge is the mere repetition of facts, it does not require elaborate rehearsal. This theme was presented before the theme of *Sustainable Development*, which was the last theme studied. The latter occurrence can be attributed to the fact that the more effectively material is rehearsed the greater its chances of being transferred to long-term memory (cf. 2.2.1.1) and so the Knowledge questions may have been answered due to a recall of information processed by long-term memory. Another reason may be that teaching that took place during the contact lecture and/or DVD exposure, that was received as organized and meaningful, referring to the Gestalt theory, and so the lecture's outcomes were clear, organized and placed within a meaningful context ensuring successful answering of Application questions with the aid of short-term memory (cf. 2.2.1.1).

The use of text with audio on DVD has proven to produce better results in the Examination than a contact session with a lecturer and/or graphics with moving pictures, etc. (DVD 2 Multimedia), as the theme *Sustainable Development*, led to the best student performance. This may be because for this theme the complex concept does not require visual aids, but literature to help build up fundamental knowledge and understanding for Application outcomes. Of great importance is the fact that the literature points to research that found that if a concept, like *Sustainable Development* in this case, is too difficult to understand then the presentation will be unsuccessful, no matter what media is used (cf. 3.6.1.4). The literature has also revealed that the effectiveness of the visual design when learning procedural or descriptive knowledge is influenced by how much prior-knowledge learners have. For this study, it may be said that due to the LASS being a compulsory module, many of the students may have had low prior-knowledge in the discipline of Geography and so did not perform well in this theme *Sustainable Development*. When answering Knowledge outcomes in an Examination in a theme like *Sustainable Development* and *Natural Resources*, the traditional contact lectures are the best as the control group performed the best.

From the above one can deduce that the DVD structure and format for Geography teaching and learning that can benefit student learning within the LASS is dependent on the nature of the theme in Geography. The use of visual pictorial examples as well as documentary excerpts, making the theme tangible, yielded good results for the multimedia DVDs i.e. DVD 2 for the *Natural Resources* Geography theme when answering Application questions in an Examination. The use of DVD 1 with a text and audio format also yielded good results when answering Application outcomes in an Examination assessing the theme *Sustainable Development* that is based on the deep understanding of a concept. Therefore, one can integrate ICT, specifically the DVD, into LASS's Geography teaching and learning. However, within the discipline of Geography, when answering Knowledge questions in an Examination, the control group that did not receive a DVD obtained the best results. This result was not what was expected beforehand. Nonetheless, this non-effect is also a finding. This could mean that the students have not yet learned to make the shift to learning with multimedia. It means that their style of learning has not changed. This supports what Nugent says in the literature (cf. 3.4.2) that a subject, with its unique characteristics, influences the success of learning via picture or audio presentations.

The averages of mean scores of the Geography themes are better than those of the History themes, except for the Application mean scores obtained in the Geography Examination. The aforementioned may have been expected as the Geography themes were handled after the History themes and the students had already acted as the experimental groups, thus, they had time to familiarise themselves with the ICT and multimedia they used. The other possible

reason for this may be that the students found the discipline of Geography more interesting, easier than the discipline of History and so were more motivated to excel.

### 5.3 CONCLUSION

The study has revealed that in this age of technology, visual resources are in some instances visibly beneficial to student learning depending on the discipline and theme of the content within the discipline. One can state that it seems as if students were not negatively affected by the use of DVDs as no major differences were noted in student achievement when the DVD was integrated in History and Geography teaching and learning within the LASS. For the assessment of Application outcomes for the theme *Sources*, traditional contact lectures yielded, the best results compared to ICT, specifically DVD integration. When answering Application questions in History for the theme Democracy in an Examination it is advisable that the structure and format of a DVD contain text, audio, still and moving graphics, schematic representations, documentary excerpts, etc. that show contemporary examples of the work at hand so as to help the teaching and learning process, and yield the best student achievement. In Geography, an interesting outcome is that when designing multimedia material one must take the theme or subject matter into consideration. Not all themes are taught and learnt to their full potential with the aid of graphics and other visual aids. Despite Geography being a highly visual subject, it is advisable that the structure and format of a DVD contain text with audio, for the Geography theme of *Sustainable Development* where a deep understanding is necessary of the concept when aiming to achieve the best results when assessing Application outcomes in Examinations. The latter has proven to be effective in student learning. The use of visual graphics on DVD in Geography has shown that it does not, generally play a significant role in the teaching and learning of the discipline, as traditional contact lectures also yielded better results for the Geography theme of *Sustainable Development* and *Natural Resources* when assessing Knowledge in an Examination. The assessment of Application outcomes for the theme *Natural Resources* yielded the best results when a DVD containing audio, text, still and moving graphics, documentary excerpts, etc. is used.

One can integrate the DVD into teaching and learning for the LASS by first establishing what the content base of the discipline is. This must be followed by a decision as to what multimedia must be used so as to evoke interest and motivate students, especially with current affairs. For example, for the discipline of History that is regarded by most as one of the less attractive disciplines, the theme *Sources* was recorded on DVD from a museum in the city, showing students the different sources that are relevant to their module's outcomes. It is also important to establish if the theme deals with content that can be complimented by visuals or if it is a complex concept that requires personal contact with the student during a contact session so as

to explain the content, for example, *Sustainable Development*. The integration of the DVD into a discipline must also take into consideration what level outcomes the lecturer wants the student to achieve with the help of the DVD. This study established that the low-level outcomes, namely Knowledge and Application do yield beneficial results to student teaching and learning depending on the theme, short-term memory or long-term memory of the student, and the type of assessment namely a test or examination. Therefore, the integration of ICT, specifically the DVD, in the discipline of History and Geography as part of the LASS can yield beneficial results in teaching and learning as it is visible in some instance even though traditional lectures also yielded good achievement and the students seemed not to have been at any disadvantage whilst being part of the control group and/or experimental group.

## CHAPTER 6

### CONCLUSION AND RECOMMENDATIONS

#### 6.1 INTRODUCTION

The aim of this study was to research *the integration of Digital Video Discs (DVDs) and multimedia in the Learning Area Social Sciences* on first-year pre-service teachers in a compulsory module at university. The purpose of this chapter is to present and discuss the major findings of this study in order to address the aims of the study, posed in chapter 1 (cf. 1.3):

- What type of multimedia resources can be used to the benefit of student learning within the LASS?
- What the structure and format of the multimedia on the DVD should look like to achieve selected learning outcomes within the LASS? and
- How can one integrate ICT, specifically the DVD, into the teaching and learning of the LASS?

In addition, the purpose of this chapter is to address the central theoretical statement that was made in chapter 1, namely that *the integration of ICT, specifically the DVD, using different multimedia in teaching and learning can be beneficial to LASS students at tertiary level*, as well as provide recommendations for future research when using ICT, specifically the DVD, in teaching and learning in the LASS.

#### 6.2 MAJOR FINDINGS IN THIS STUDY

The major findings of this study are discussed by referring to the three research aims.

##### 6.2.1 The type of multimedia resources that can be used to the benefit of student learning within the LASS

History and Geography multimedia resources that can be used within the LASS to the benefit of student learning are discussed separately below.

### **6.2.1.1 Multimedia resources for History**

This study has established that in History teaching the best results were achieved after students used pictures, and documentary excerpts, etc. for the *Democracy* theme only (cf. 5.2.1.3) when Application outcomes are assessed in an Examination. This confirms the finding in the literature (cf. 3.4.2) that the use of visual and audio resources produce learning superior to audio and text resources.

The literature overview (cf. 3.5.2) listed resources that are regarded as excellent media that can be used with specialised ICT like the DVD to support History teaching and learning. They include: graphics from the Internet or CD-ROM software; clips from television programmes; audio and visual primary and secondary source material for example like clips from historical films and historical fiction and non-fiction; text sources; documentary radio programmes and video documentaries; self-produced video clips using music; etc. as well as multimedia text sources linked to the glossary. The majority of the items listed in the latter were used in the History DVDs made for this study (cf. 4.2.5.1) and as stated above resulted in the best achievement for students in the theme *Democracy* when Application outcomes are assessed in an Examination.

### **6.2.1.2 Multimedia resources for Geography**

The study's outcome for Geography teaching was theme specific. Students that received text with audio for the *Sustainable Development* theme achieved the best results when assessing Application outcomes for the Examination (cf. 5.2.2.3). Students that received the *Natural Resources* theme containing audio, pictures, and document excerpts, etc. achieved the best results (cf. 5.2.2.3) when assessing Application outcomes for the Examination. This confirms Mayer's dual channel theory (cf. 2.2.3.1) and the literature references to Nugent's research (cf. 3.4.2) that state that the combination of visuals together with audio, in theory, promotes deeper learning in students than audio resources alone. The literature (cf. 3.4.2) also indicated that student learning seems to be more advantageous when visual resources are used instead of text in oral presentations. The latter holds true for the *Natural Resources* theme in this study (cf. 6.2.2), but not for the *Sustainable Development* theme in Geography teaching (cf. 6.2.2).

The literature strongly recommended images as well as text as advantageous inclusions for Geography students (cf. 3.5.3), of which both were used in the study (cf. 4.2.5.1). For difficult topics or concepts, the literature recommended the use of video, graphics, or models (cf. 3.5.3) as well as text when planning to present complex materials (cf. 3.4.2). The study has, however, shown that for a difficult concept like *Sustainable Development* when assessing Application

outcomes for the Examination, text and audio achieve the best results (cf. 5.2.2.2.2) and not video excerpts with audio and text, ect. The study showed that for a theme like *Natural Resources* the best results were achieved when assessing Application outcomes for the Examination when using audio, pictures, documentary excerpts, etc. The literature showed that audio-visual resources are strongly recommended because visual presentations and representation are integral parts of Geography education.

The literature lists multimedia resources that can be used with specialized ICT (cf. 3.5.3) to support Geography teaching and learning, for example in this study a DVD player. They include audio and visual images from the Internet, digital cameras, etc.; downloadable video clips of current satellite imagery via the WWW; simulations and models; animated diagrams; as well as self-produced audio and visual video clips.

#### **6.2.1.3 General discussion of the type of multimedia resources that can be used to the benefit of student learning within the LASS**

Mayer's dual channel theory (cf. 2.2.3.1) and the literature references to Nugent's research (cf. 3.4.2) both state that the combination of visuals together with audio, in theory, promotes deeper learning in students than audio resources alone. This study has confirmed what was stated in the latter literature findings, as DVD 2-Multimedia that contained still and moving graphics, audio, text, documentary excerpts, etc. for the *Democracy* and *Natural Resources* themes, both when assessing Application outcomes for the Examination (cf. 5.2.1.2 & 5.2.2.1), achieved the best student results. Therefore, the best resources for student learning in the LASS are still and moving graphics, audio, text, documentary excerpts, etc. for the *Democracy* and *Natural Resources* themes, both when assessing Application outcomes for the Examination. Text with audio used for a more complex theme like *Sustainable Development* when assessing Application outcomes for the Examination (cf. 5.2.2.2), is part of the best resources for student learning in the LASS.

What one can deduce from this study and the literature, as stated above, is that within the LASS, specifically the disciplines of History and Geography, learners do prefer visual effects, moving pictures, etc. with educational content to learn from, but text and audio as well as traditional lectures also result in the best student achievement, which is also theme specific.

### 6.2.2 The structure and format of multimedia on DVD to achieve selected learning outcomes within the LASS

With reference to this study the following conclusions have been made with respect to the structure and format of the multimedia found on the DVDs used in this research study.

For History teaching and learning within the LASS:

- The assessment of History Knowledge and Application outcomes in a Test and Semester Test for the theme *Sources*, show no major differences in the adjusted mean scores of students when using DVDs (DVD 1-Text and DVD 2-Multimedia) with a different structure and format or a traditional contact lecture. This does not entirely correspond with the literature study. The literature (cf. 3.5.2) states that university History students preferred using digital historical resources, as they understood the historical cause-and-effect relationship better using the digital resources. Students also rated film and video, as the most useful, since it helped them to visualise events. The use of many visual sources and documentary excerpts on DVD in the *Sources* theme did not have the expected effect on students in this study as is evident in the results.
- The only significant difference in the *Sources* theme was noted in Test 1 as the Assessment of Application outcomes showed how the control group performed significantly better than the DVD groups (cf. 5.2.1.1.1-5.2.1.1.3). The reason for the poorer achievement by the DVD groups may be attributed to poor analysis of and connection of information during the processing stage as referred to in the literature (cf. 2.2.1.2). This may point to the DVDs' structure and format not having contributed to the learning process. Students may have been distracted and so not paying full attention resulted in superficial processing of information that lead to information being forgotten. The other possibility may be that according to the cognitive load theory (cf. 2.2.3.2.1), learner's with low-prior knowledge (in this case the LASS is a compulsory module also meaning that many students last had contact with the discipline of History three years ago at school) (cf. 3.5.1 & 4.2.3) in the discipline of History, may have experienced high cognitive load. This means that when they used discovery-based multimedia, they may have experienced cognitive overload when processing complex verbal and pictorial representations with no guidance. This refers to the fact that the two DVDs used for this theme (DVD 1-Text *Sources* & DVD 2-Multimedia *Sources*) may not have provided enough support, compared to the contact lecture (cf. 5.2.1.1).
- The results of this study show that when teaching a theme like *Democracy*, the use of a multimedia DVD, with visual pictures, schematic representations, documentary excerpts, etc. and simultaneous audio explanations, is the best DVD structure and format for History DVDs ensuring the best student achievement when Application outcomes are

assessed in an Examination. This confirms what the literature states (cf. 2.2.3.1). It states that the dual channel assumption claims that humans possess separate channels for processing visual and auditory information and so students learn more deeply from multimedia using text and picture explanations than from a verbal explanation as was the case with DVD 1 (Text & audio) and the contact lecture because DVD 2 (Multimedia) showed the best student achievement. Nugent's research referred to in the literature (cf. 3.4.2), showed that when visuals were combined with text or audio, learning was generally maximized. This shows that a strong relationship exists between multimedia presentations and student learning

- In the theme *Democracy*, there were no major differences in the adjusted mean scores of students amongst the control group and experimental groups in Test 2's Knowledge and Application outcomes and in the Examination's assessment of Knowledge outcomes (cf. 5.2.1.2.1-5.2.1.2.3). As mentioned above, this does not correspond with the literature study (cf. 3.5.2) stating that university students preferred using digital historical resources.

For Geography teaching and learning within the LASS:

- No major differences in the adjusted mean scores of students are shown for the *Natural Resources* theme amongst the control group and experimental groups for Test 3's assessment of Knowledge and Application outcomes (cf. 5.2.2.1.1-5.2.2.1.3). The use of many visual sources and documentary excerpts on DVD 2 (Multimedia) in the *Natural Resources* theme did not have the expected effect on students in this study as is evident in the results. This is despite the literature stating that Geography is a highly visual subject complimented well by multimedia (cf. 3.5.3). A possible reason why the multimedia did not result in the best achievement may be because the students did not interpret the visuals and resource material selected for them and they may not have recorded the visual information into memory. Similarly, the students may only have glanced through the multimedia material, enjoying the visual presentations, but without significant learning taking place, as stated in the literature (cf. 3.5.3).
- Traditional contact lectures for the *Natural Resources* theme, lead to the best adjusted mean scores being achieved for the Knowledge outcomes assessed in the Examination. The reason for this outcome and not the expected outcome of the DVD groups achieving the best results, despite multimedia (images & text) being advantageous to students learning Geography, does correspond with the literature study (cf. 3.5.3). It states that one must be aware of the link between poor quality, poor use of resources and ineffective teaching and learning in Geography, as it may counteract the benefits that the inclusion of ICT and multimedia bring to Geography teaching and learning. In this case, the multimedia used may not have been to the benefit of the students, as was intended.

- The use of text, audio, still and moving graphics, etc. achieved the best adjusted mean scores on student achievement for the *Natural Resources* theme when assessing Application outcomes for the Examination. This confirms what the literature states (cf. 2.2.3.1). It states that the dual channel assumption claims that humans possess separate channels for processing visual and auditory information and so students learn more deeply from multimedia using text and picture explanations hence, DVD 2 (Multimedia) showed the best student achievement, when compared to a verbal explanation (DVD 1-Text & audio) and the contact lecture. Nugent's research referred to in the literature also showed that when visuals were combined with text or audio, learning was generally maximized (cf. 3.4.2). This shows that a strong relationship exists between multimedia presentations and student learning.
- No major differences in the adjusted mean scores of students are shown for the *Sustainable Development* theme amongst the control group and experimental groups for Test 4's assessment of Knowledge and Application outcomes (cf. 5.2.2.2.1-5.2.2.2.3). The literature, reviews research that states that visuals were compared to text using university students and found no significant difference between learning from these different presentations (cf. 3.4.2). The literature, therefore, corresponds with this study's outcome, as it states that a subject, with its unique characteristics, influences the success of learning, via picture or audio presentations. This means that in the discipline of Geography one must take into account that different themes respond better to different resources used in teaching and learning, and at times they may have the same effect on student achievement.
- The study found that when teaching and learning the Geography theme *Sustainable Development* the best adjusted mean scores were achieved by the group that received the traditional contact lecture for the Knowledge outcomes assessed in the Examination. This may be attributed to the multistore model of information-processing (cf. 2.2.1.4). The literature states that recall is the best for the first items learned (it is processed into long-term memory), and the last items learned (it is processed into short-term memory). Since this model is suited for encoding audio material in short-term memory (cf. 2.2.1.4), the contact lecture that took place shortly before the examination may have suited the situation. This means that the information that was encoded through words during the contact lecture was stored into short-term memory.
- The use of text and audio for the *Sustainable Development* theme achieved the best adjusted mean scores on student achievement when assessing Application outcomes for the Examination. This corresponds well with the literature (cf. 3.4.2) as it states that text has an important advantage for the presentation of complex materials, like the complex concept of Sustainable Development. The literature does, however, state that due to Geography being regarded as a highly visual subject multimedia can compliment

it (cf. 3.5.3). It states further that for a difficult concept to be mastered the use of a medium, for example, in this study DVD 2 with still and moving graphics, text, audio, documentary excerpts, etc., the images and text are most likely to be advantageous to students learning Geography (cf. 3.5.3). The latter did not, however, result in the best student achievement contrary to what is stated in the literature.

The analysed data shows that, in general, the use of text and audio alone or multimedia or traditional contact sessions yield no major differences in the mean scores of the students (cf. 5.2.1.3 & 5.2.2.3). The results also indicate that the nature of the History and Geography theme are factors that need to be taken into consideration when deciding on the structure and format of multimedia on the DVD to ensure that student learning within the LASS is benefited by the use of different resources on DVD (cf. 5.2.1.3 & 5.2.2.3). In general, from this study, one can deduce from the best performances by the groups using DVD 1 and DVD 2 in both disciplines, that constructive learning as active, outcome-oriented and self-regulated learning, with the aid of ICT and multimedia, can result in good achievement by students. This also shows that teaching styles can be changed to new constructive methods of teaching. This is due to the increased use of ICT to obtain and process information, so as to ensure learning (cf. 2.2.2).

### **6.2.3 The integration of ICT, specifically the DVD, into the teaching and learning of the LASS**

The literature overview confirms that ICT and multimedia can be integrated successfully in teaching and learning (cf. 3.3 & 3.3.1). In order to understand how to design multimedia teaching material, which draws on the senses, due to the visual and auditory nature of multimedia, cognitive theories of learning, were researched to establish how the human mind works when teaching and learning with the aid of ICT and multimedia (cf. 2.2).

Within the information-processing theory, the levels-of-processing model supports learning through multimedia. It states that teachers can change their teaching methods and cater for learners with different learning styles by incorporating ICT into their teaching methods (cf. 2.2.1). For example, when encoding takes place through a specific medium, such as multimedia with visuals, the best results are achieved when the learner is assessed using visuals (cf. 2.2.1.4). According to information processing's multistore model (cf. 2.2.1.1), the more effectively information becomes rehearsed the greater the chance of it becoming long-term memory. In this study, repeated use of the DVD before a Test (Test 2) ensured better student achievement in the discipline of History (cf. Table 5.5) when answering Knowledge questions in the theme *Democracy* when compared to the control group, despite no statistical and practical significance. This was also the case when answering Knowledge questions some

time after teaching and learning, in the Examination, also despite no statistical and practical significance. The use of text, audio, still and moving graphics, schematic representations, documentary excerpts, etc. for the theme *Democracy* achieved the best results for Application outcomes in an Examination relying on long-term memory. The latter, was achieved even though Application outcome results were lower in the Examination, compared to the Knowledge outcomes, due to information not being captured sufficiently in long-term memory to answer Application questions. The use of ICT and the integration of the DVD into History teaching, within the LASS, has shown improvement in the interest in the discipline, evident in student achievement (cf. 5.2.1.2.1-5.2.1.2.3). The fact that a DVD with still and moving graphics, schematic representations, documentary excerpts, text and audio led to the best results by students in the Examination, for the theme *Democracy* shows, that the DVD can be integrated successfully into History teaching and learning. A discipline like History, traditionally regarded to be a mass of dates and facts, can be improved with visuals and audio sources to motivate and evoke interest and improve student achievement.

The constructivist theory of learning (cf. 2.2.2) is also well suited for teaching with ICT as it leads to an interactive style of teaching, whereby the learner develops new skills that are linked to deep level-processing and critical thinking. The cognitive theory of multimedia learning, which relates to how the human mind works, with respect to a learners involvement with verbal, visual and visual-spatial thinking, has shown that multimedia presentations have the potential to result in deeper learning and understanding than presentations in one format. From this study, one can say that this is applicable to History teaching as was seen for the themes, *Sources* and *Democracy*. In the *Sources* theme the control group that received the traditional contact lecture which included audio, text, and some visuals performed the best, as well as the experimental group for the theme *Democracy*, that used the DVD containing the multimedia that included text, audio, still and moving graphics, schematic representations, documentary excerpts, etc. This means that the DVD can be integrated in History teaching and learning.

The integration of ICT in the discipline of Geography has shown how, with the specific use of a DVD, long-term memory helps Application questions to be answered. In the discipline of Geography when deciding to integrate DVDs into teaching and leaning, one must remember that the theme must be taken into consideration. DVD 2 containing text, audio, still and moving graphics, schematic representations, documentary excerpts, etc. was more beneficial to student teaching and learning for the *Natural Resources* theme, as it led to the best results being achieved. The DVD using text and audio can be integrated successfully into complex Geography themes like *Sustainable Development* as this DVD (DVD 1-Text) produced the best student results when answering Application questions in an Examination.

### 6.3 CENTRAL THEORETICAL STATEMENT

From the research study concluded above one can assume the central theoretical statement stating that *the integration of ICT, specifically the DVD, using different multimedia in teaching and learning can be beneficial to LASS students at tertiary level* can be accepted as it did benefit History and Geography teaching and learning as discussed above.

### 6.4 RECOMMENDATIONS FOR FUTURE RESEARCH

The recommendation for future research is that one must investigate the nature of themes in each of the discipline's curriculum used in this study. This is to establish whether it is a theme that requires explanations using multimedia, for example, still and moving graphics, audio and text, documentary excerpts, animations, etc. or whether a simple white board explanation with text and pictures drawn by hand, that can be saved in a file and accessed by learners electronically, is more suitable. One can use this information to set up a didactical guide for pre-service teachers in the LASS methodology module. For example, investigating in Geography whether a theme like *Humankind's influence on the environment* requires visual images of the devastation of the environment around the world, or straight forward verbal examples communicated during a contact lecture. More longitudinal research is needed spanning over a longer period with more themes involved, thus, ideally for the whole semester module. This can also be researched in the other seven Learning Areas. It is also recommended that one establish how much prior knowledge a student has as the instructional design of multimedia for low-prior knowledge learners should increase germane cognitive load (i.e. include more diagrams/representations) and decrease extraneous cognitive load (i.e. eliminate irrelevant resources) so as not to limit short-term memory resources.

### 6.5 CONCLUSION

The study has revealed, after a literature review and empirical study, that the integration of ICT, specifically the DVD, using different multimedia in teaching and learning can be beneficial to LASS students at tertiary level. The best type of multimedia resources that can be used to the benefit of student learning within the LASS includes still graphics from the Internet; excerpts from television documentaries, e.g. news programmes; audio and visual primary and secondary source material; text sources; images with text; and audio-visual resources. The structure and format of the multimedia on the DVD that should be used in order to achieve selected learning outcomes, within the LASS, differs with respect to the two disciplines that make up the LASS. In History teaching and learning text with audio, documentary excerpts, schematic representations, as well as still and moving images leads to the achievement of learning

outcomes for the theme *Democracy*. The use of visual pictorial examples, documentary excerpts, and text with audio has been identified in this study as the best multimedia for integration in a DVD for the Geography theme *Natural Resources*. In Geography teaching and learning the use of text with audio has proven to be the best structure and format for multimedia on DVD for the theme *Sustainable Development*. Despite Geography being a visual discipline, this study has proven that the theme/content plays an important part in the structure and format, which should be used in order to achieve learning outcomes. The integration of ICT, specifically the DVD, into the teaching and learning of the LASS demands careful consideration with respect to the benefits of DVDs to each discipline. Therefore, in History teaching, within the LASS, a DVD can be integrated successfully into teaching and learning if it contains text, audio, still and moving graphics, schematic representations, and documentary excerpts. The DVD structure and format for Geography teaching and learning that can benefit student learning within the LASS is dependent on the nature of the theme in Geography.

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## **ADDENDUM A**



**REQUIREMENTS FOR THIS PAPER:**

Multi choice cards: ☒

Non-programmable calculator: ☐

Graphic paper: ☐

Laptop: ☐

Open book examination ☐

TOETS/  
TEST:

Klastoets/Class test

GRADE/DEGREE/  
/ DIPLOMA:

**B.Ed**

VAKKODE/  
SUBJECT CODE:

**LASW111**

DUUR/  
DURATION: 20 min.

VAK / SUBJECT:

SOSIALE  
SCIENCES

WETENSKAPPE/SOCIAL

MAKS / MAX: 30

EKSAMINATOR(E)/  
EXAMINER(S):

LO de Sousa

DATUM / **28/02/2006**  
DATE:

**VRAAG 1 / QUESTION 1**

**MULTIKEUSE / MULTIPLE CHOICE [15x2=30]**

Kies uit elk van die volgende vrae ( Vraag 1 - 6 ) **EEN KORREKTE ITEM**. Merk die toepaslike nommer (1-4) teenoor die ooreenstemmende vraagnommer op die multikeusekaart./ *Choose from each of the following questions (Question 1 - 6 ) **ONE CORRECT ITEM**. Mark the appropriate number (1-4) next to the corresponding question number on the multiple choice card.*

1. Sone van die aarde waar lewe te vinde is wat bestaan uit lug, water en grond. / *Zone of the earth where life is found consisting of air, water and soil.*
  1. Ekosisteem / *Ecosystem*
  2. Habitat / *Habitat*
  3. Biosfeer / *Biosphere*
  4. Nis / *Niche*
2. Bevolkings van alle spesis wat in 'n gebied bly en waar interaksie plaasvind op 'n sekere tyd. / *Populations of all species living and interacting in an area at a particular time*
  1. Organismes / *Organisms*
  2. Habitat / *Habitat*
  3. Nis / *Niche*
  4. Gemeenskap / *Community*
3. Alle plant-etende diere behoort saam op die \_\_\_\_\_ trofiese vlak. / *All herbivores belong to the \_\_\_\_\_ trophic level.*
  1. Eerste / *First*
  2. Tweede / *Second*
  3. Derde / *Third*
  4. Vierde / *Fourth*
4. \_\_\_\_\_ behels die fisiese, chemiese en biologiese omstandighede wat nodig is vir 'n spesie om te oorleef en te reproduseer. / *\_\_\_\_\_ consists of the physical, chemical and biological conditions a specie needs to live and reproduce.*
  1. Fotosintese / *Photosynthesis*
  2. Biosfeer / *Biosphere*
  3. Habitat / *Habitat*
  4. Nis / *Niche*

**5. 'n Reeks organismes wat 'n voorafgaande organisme eet of ontbind. / A series of organisms each eating or decomposing the preceding one.**

1. Voedselketting / Food chain
2. Voedselweb / Food web
3. Trofiese vlak / Trophic level
4. Autotroof / Autotroph

**6. Om 'n negatiewe omgewingsimpak te minimaliseer moet 'n gemeenskap ... / To minimize a negative environmental impact, a community should ...**

1. Weekliks plaagdoders op plante in 'n park spuit. / spray pesticides weekly on plants in parks.
2. Vergunning gee aan 'n chemiese vervaardigings maatskappy om net 'n nywerheid te bou langs een van die mere. / permit a chemical manufacturing company to build a factory by one of the lakes only.
3. Bou 'n nuwe pad in 'n voetslaan gebied gebaseer slegs op die ekonomiese voordeel. / build a new road in a hiking area based only the economic advantages.
4. Oorweeg die risiko en voordele wat betrokke is in die bou van 'n toksiese afval terrein binne sy grense voordat 'n protokol geskryf word. / consider the risks and benefits involved in building a toxic waste site within its boundaries before writing a protocol.

**Kies uit elk van die volgende vrae (Vraag 7-15) die een item wat NIE pas NIE. Merk die toepaslike nommer (1-4) teenoor die ooreenstemmende vraagnommer op die multikeusekaart. / Choose from each of the following questions (Question 7-15) the one item that does NOT fit. Mark the appropriate number (1-4) next to the corresponding question number multiple choice card.**

**7. Uitkomsgebaseerde onderwys se fokus lê by ... / Outcomes based education places its focus on ...**

1. vaardighede, kennis, houdings en waardes. / skills, knowledge, attitudes and values.
2. self-ontdekking. / individual discovery.
3. kennis-afhanklikheid. / knowledge dependency.
4. probleemoplossing en kritiese denke. / problem solving and critical thinking.

**8. Die Geografie leeruitkomstest vir Sosiale Wetenskappe ontwikkel die volgende leerder-vaardighede: / The Geography learning outcomes for Social Sciences develops the following learner skills:**

1. Ondersoekende vaardighede na begrippe en prosesse. / Investigating skills into concepts and processes.
2. Ondersoekende en interpreterende vaardighede om die verlede en hede te ondersoek. / Investigating and interpretation skills into the investigation of the past and present.
3. Besluitnemings vaardighede m.b.t. sosiale- en omgewingskwessies. / Decision making skills regarding social and environmental issues.
4. Kritiese ontleding van die interverwantskappe tussen die mens en die omgewing. / Critical analysis of the interrelationship between humankind and the environment.

**9. Die Leerarea Sosiale Wetenskappe behels ... / The Learning Area Social Sciences involves ...**

1. die studie van die verhouding tussen mense, hulpbronne en die omgewing oor tyd en ruimte. / the study of the relationship between people, resources and the environment over time and space.
2. die studie van dele van die aarde se komponente onafhanklik van gebeure van die verlede. / the study of certain components of the earth independent of occurrences of the past.
3. omgewingsopvoeding en menseregte-opvoeding / environmental and human rights education
4. die studie van gebeure wat beïnvloed is deur sosiale, politieke, ekonomiese en omgewingskwessies asook mense se waardes, houdings en oortuigings. / the study of occurrences that are influenced by social, political, economic and environmental issues as well as values, attitudes and beliefs.

10. **Die Amasone reënwood het 'n ... / The Amazon rainforest has a/an ...**
1. ekosisteem met 'n komplekse voedselweb. / ecosystem with a complex food web.
  2. stabiele gesonde ekosisteem. / stable healthy ecosystem.
  3. volwasse ekosisteem met diverse spesies. / mature ecosystem with diverse species.
  4. onstabiele ekosisteem waar plaë ander spesies soms uitwis. / unstable ecosystem where pest plagues usually wipe out a specie.
11. **Gesondheidsrisiko's geassosieer met lae-inkomstegebiede sluit in ... / Health risks associated with low income areas include ...**
1. voedingstekort en lae inkomste oor. / nutritional deficiencies and low income.
  2. slegte ventilasie in huise dra siektes. / poor ventilation in houses transmits diseases.
  3. vullis en vuilwater is 'n broeiplek vir muskiete. / garbage and wastewater is breeding place for mosquitoes.
  4. tifus, disenterie, diarrhea, cholera a.g.v. onvoldoende water vir huishoudelike gebruik. / typhoid, dysentery, diarrhoea; cholera as a result of insufficient water for domestic use.
12. **'n Winkelsentrum wat gebou gaan word in 'n bewarings-omgewing mag die volgende negatiewe effekte op daardie sensitiewe ekosisteem hê: / A shopping mall to be built in a government-protected environment may lead to the following negative effects on that fragile ecosystem:**
1. vermindering in plantdiversiteit. / a decrease in plant diversity.
  2. plantverwydering sal diere se habitate verminder. / plant destruction would reduce animal habitats.
  3. veranderinge in die samestelling van die chemikalieë van die lug, grond en water sal die sensitiewe ekosisteem versterk. / changes to the chemical composition of the air, soil and water will strengthen the fragile ecosystem.
  4. besoekers aan die winkelsentrum sal die lugbesoedeling vermeerder. / visitors to the mall lead to an increase in air pollution.
13. **Mense maak die omgewing minder stabiel deur ... / Humans make the environment less stable by ...**
1. biodiversiteit te verminder. / reducing biodiversity.
  2. bekendstelling van tegnologie. / introducing technologies.
  3. bekendstelling van organiese boerdery. / introducing organic farming.
  4. verandering van die kwaliteit van water, lug en grond. / changing the quality of the water, air and soil.
14. **Gesondheidsprobleme wat jou kan oorkom as jy by 'n afvalherwingsaanleg bly is: / Health problems that one can acquire if staying at a waste-recycling plant.**
1. kanker / cancer
  2. allergiese reaksies / allergic reactions
  3. voedselvergiftiging / food poisoning
  4. nie een van die bogenoemde nie / not one of the above mentioned
15. **'n Stad het die volgende kenmerkende impak op 'n ekosisteem: / A city has the following characteristic impact on an ecosystem:**
1. grondprofiel is versteur en grondvorming word kunsmatig ondersteun. / soil profiles are disturbed and soil formation is aided artificially.
  2. lugbesoedeling standarde en kontrole is deur die industrie vasgestel met hoë koste om die omgewing te beskerm. / air pollution standards and controls are set by industry at a huge cost to protect the environment.
  3. verstedeliking lei tot groot hoeveelhede afval wat druk op die omgewing plaas. / urbanisation leads to large quantities of waste exerting pressure on the environment.
  4. natuurlike plantegroei en diere is vernietig en uitgeroei. / natural vegetation and animals are destroyed and eradicated.

**TOTAAL: 30**

## **ADDENDUM B**

|                                                         |                                                       |
|---------------------------------------------------------|-------------------------------------------------------|
| <b>Requirements for this paper:</b>                     |                                                       |
| Multi choice cards: <input checked="" type="checkbox"/> | Non-programmable calculator: <input type="checkbox"/> |
| Graphic paper: <input type="checkbox"/>                 | Laptop: <input type="checkbox"/>                      |

|                       |                          |
|-----------------------|--------------------------|
| Open book examination | <input type="checkbox"/> |
|-----------------------|--------------------------|

|                                                                |                                                                                                              |                                                                      |                          |
|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|--------------------------|
| TOETS/<br>TEST:<br>VAKKODE/<br>SUBJECT CODE:<br>VAK / SUBJECT: | MULTIKEUSE 2/ MULTIPLE CHOICE 2<br>LASW111<br>Leerarea Sosiale Wetenskappe/<br>Learning Area Social Sciences | GRADE/DEGREE/<br>/ DIPLOMA:<br><br>DUUR/<br>DURATION:<br>MAKS / MAX: | B.Ed<br><br>20 min<br>30 |
| EKSAMINATOR(E)/<br>EXAMINER(S):                                | LO DE SOUSA<br>P WARNICH                                                                                     | DATUM<br>DATE:                                                       | / Maart 2006             |

Begin op volgende reël tik

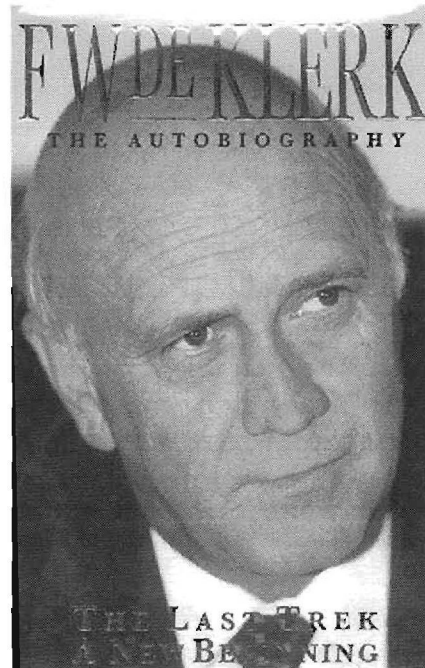
**MULTIKEUSE / MULTIPLE CHOICE (15X2 = 30)**

**Afdeling A / Section A**

Kies uit elk van die volgende vrae ( Vraag 1 - 5 ) **EEN KORREKTE ITEM**. Merk die toepaslike nommer (1-4) teenoor die ooreenstemmende vraagnommer op die multikeusekaart./ Choose from each of the following questions (Question 1 - 5 ) **ONE CORRECT ITEM**. Mark the appropriate number (1-4) next to the corresponding question number on the multiple choice card.

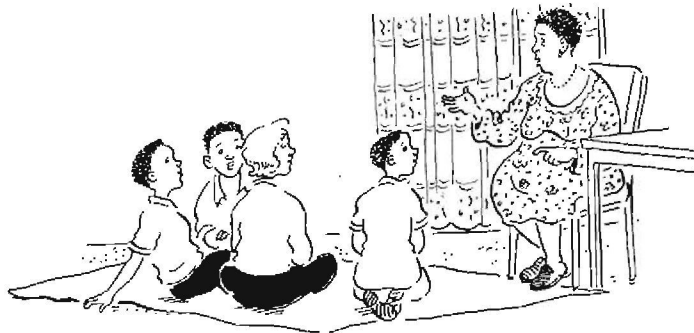
1. **Kenmerke van kolonialisme. / Characteristics of colonialism.**
  1. Imperialisties van aard. / Imperialistic by nature.
  2. Demokraties van aard. / Democratic by nature.
  3. Menseregte word beskerm. / Human Rights are protected.
  4. Indirekte beheer. / Indirect rule.
  
2. 'n Voorbeeld van mondelinge primêre bronne wat in die Sosiale Wetenskappe gebruik kan word is ... / An example of an oral primary sources that can be used in Social Sciences are ...
  1. Muntstukke / Coins
  2. Legendes / Legends
  3. Briewe / Letters
  4. Nie een van bogenoemde nie / Not one of the above mentioned
  
3. **Besluit watter van die volgende is die korrekte beskrywing vir Bronne A & B.**  
 Bron A: 'n Britse militêre begraafplaas in Eshowe is die rusplek van soldate wat in 1879 gesterf het.  
 Bron B: Die Koning Cetshwayo Gedenkteen wys die plek aan waar die Koning in 1884 gesterf het. /  
 Decide which of the following are the correct source descriptors for Source A & B:  
 Source A: A British Military Cemetery in Eshowe is the resting place of soldiers who died in 1879.  
 Source B: The King Cetshwayo Memorial marks the site where the King died in 1884.
  1. A: Sekondêre materiële en geskrewe bron. ; B: Primêre materiële en geskrewe bron. /  
A: Secondary material and written source; B: Primary material and written source.
  2. A: Sekondêre materiële en geskrewe bron. ; B: Sekondêre materiële en geskrewe bron. /  
A: Secondary material and written source; B: Secondary material and written source.
  3. A: Primêre materiële en geskrewe bron. ; B: Sekondêre materiële en geskrewe bron. /  
A: Primary material and written source. ; B: Secondary material and written source.
  4. A: Sekondêre materiële bron. ; B: Sekondêre materiële bron. /  
A: Secondary material source. ; B: Secondary material source.

4. Die bron in Figuur 1 is 'n outobiografie deur FW de Klerk en staan bekend as 'n \_\_\_\_\_ bron omrede \_\_\_\_\_. / *The source seen in Figure 1 is an autobiography by FW de Klerk and is regarded as a \_\_\_\_\_ source reason being \_\_\_\_\_.*
1. primêre geskrewe; dit vertel ons van die lewe van FW de Klerk. / *primary written; it tells us about the life of FW de Klerk.*
2. primêre geskrewe; dit is geskryf deur 'n aantal mense. / *primary written; it is written by a number of people.*
3. sekondêre geskrewe; dit is 'n outobiografie. / *secondary written; it is an autobiography.*
4. sekondêre geskrewe; dit is 'n biografie. / *secondary written; it is a biography.*



Figuur 1 / Figure 1

5. Die storie waarna die kinders in Figuur 2 luister kan 'n primêre en sekondêre bron wees as ... / *story that the children in Figure 2 are listening to can be a primary and secondary oral source if ...*
1. Primêr: die vrou vertel van haar gedwonge verplasing van Sophiatown in die 1950's. Sekondêr: die vrou vertel van die gedwonge verplasing wat sy oor gelees het in Pole in die 1930's. / *Primary: the lady tells about her forced removal from Sophiatown in the 1950s. Secondary: the lady tells about the forced removals she read about in Poland in 1930s.*
2. Primêr: die vrou vertel van die gebeurtenis wat sy beleef het. Sekondêr: die vrou vertel van die gebeurtenis wat sy en haar ouma beleef het. / *Primary: the lady tells us about the experience she had. Secondary: the lady tells us the experience she and her grandmother had.*
3. Primêr: die vrou vertel van die legende van die Zoeloes oor die beeste. Sekondêr: die vrou vertel van die legende van die Zoeloes oor die beeste wat oorvertel word deur stamhoofde. / *Primary: the lady tells about the Zulu legend of the cattle. Secondary: the lady tells about the legend of the Zulu cattle as is retold by the chiefs.*
4. Primêr: die vrou vertel van die storie wat sy van haar oupa gehoor het. Sekondêr: die vrou oorvertel die storie wat sy van haar oupa gehoor het. / *Primary: the lady tells the story that she heard from her grandfather. Secondary: the lady retells the story her grandfather told her.*



Figuur 2 / Figure 2

**Afdeling B / Section B**

Kies uit elk van die volgende vrae (Vraag 6-15) die een item wat NIE pas NIE. Merk die toepaslike nommer (1-4) teenoor die ooreenstemmende vraagnummer op die multikeusekaart./ Choose from each of the following questions (Question 6-15) the one item that does NOT fit. Mark the appropriate number (1-4) next to the corresponding question number multiple choice card.

6. **Die geskiedenis van die Renaissance is 'n geskiedenis van die ... / The history of the Renaissance is a history of the ...**
1. herlewing van literatuur en kuns in Europa. / *revival of literature and art in Europe.*
  2. herlewing in Europa vanaf die 14de tot die 16de eeu in wetenskap, kuns, literatuur, ens. / *revival in Europe from the 14th to the 16th century in science, art, literature, etc.*
  3. Italiaanse samelewing wat gedomineer was deur die Kerk en 'n sentrale politieke instelling. / *Italian society that was dominated by the Church and a central political institution.*
  4. samelewing wat tot stand gekom het na die periode van die feodale samelewing van die Middeleeue waar die Kerk 'n dominerende rol gespeel het in die intellektuele en kulturele lewe. / *society that came to be after the period of the feudal society of the Middle Ages where the Church dominated the intellectual and cultural life.*
7. **Die feodale sisteem was ... / The feudal system was ...**
1. 'n sosiale, politieke en ekonomiese sisteem gedurende die Middeleeue. / *a social, political and economic system during the Medieval Europe.*
  2. 'n sisteem waar vasale (onderdane) land gegee is deur here in ruil vir militêre diens. / *a system whereby vassals (subordinates) were granted land by lords in return for military service.*
  3. 'n regeringstipe gebaseer op diens. / *a type of government based on service.*
  4. 'n regeringstipe waar onderdane onafhanklik van die Koning was. / *a type of government where subordinates were independent of the King.*
8. **Die Renaissance in Europa het verder as die Middeleeue gestrek tot binne die verlede van die Antieke Grieke en Romeine om sy hergeboorte te volbring. Afrika Renaissance moet die boeie van ... losmaak. / The Renaissance in Europe went beyond the Middle Ages into the past of Ancient Greece and Rome to achieve its rebirth. African Renaissance must undo the shackles of ...**
1. kolonialisme / *colonisation*
  2. rassisme / *racism*
  3. slawerny / *slavery*
  4. afhanklikheid / *dependence*
9. **Afrika Renaissance behoort volgens Stremlau gegrondves te wees in ... / According to Stremlau Africa Renaissance must be rooted in ...**
1. die ekonomiese herlewing van Afrika. / *the economic rebirth of Africa.*
  2. die begin van neo-koloniale verhoudinge tussen Afrika en die wêreld se ekonomiese magte. / *the beginning of neo-colonialism between Africa and the world's economic powers.*
  3. die mobilisering van die Afrikane om hul toekoms in eie hande te neem. / *the mobilisation of the Africans to take responsibility for their own future.*
  4. die vestiging van politieke demokrasie. / *the establishment of political democracy.*
10. **Afrika Renaissance word volgens Lathan deur die volgende faktore gestrem ... / According to Lathan, African Renaissance is impeded by ...**
1. demokratiese regerings. / *democratic governments.*
  2. sosio-ekonomiese agteruitgang. / *socio-economic decline.*
  3. uitsluiting van minderheids- of meerderheidsgroepe van die regering. / *exclusion of minority and majority groups from governance.*
  4. politieke en sosiale konflikte. / *political and social conflicts.*

- 11. Humanisme word gekenmerk deur ... / Humanism is characterised by ...**
1. die intellektuele en literêre bewegings van die Renaissance. / *the intellectual and literary movements of the Renaissance.*
  2. klassieke geskrifte vanuit die kloosters deur die monnike. / *classical writings from the monasteries by monks.*
  3. die studie van die Griekse en Romeinse klassieke geskrifte. / *the study of Greek and Roman classical writings.*
  4. 'n klem op menslike belange eerder as op geloof. / *an emphasis on human interests rather than on religion.*
- 12. 'n Argief is 'n plek waar ... / An archive is a place where ...**
1. daar oorwegend sekondêre en primêre bronne is. / *there are predominantly secondary and primary sources.*
  2. publieke rekords en historiese dokumente bewaar word. / *public records and historical documents are kept.*
  3. 'n versameling van waardevolle historiese rekords geberg word: dokumente, foto's, films, videobande, klankopnames, ens. / *a collection of historically valuable records are being kept: documents, photographs, films, videotapes, sound recordings, ect.*
  4. daar hoofsaaklik primêre bronne is. / *there are mainly primary sources.*
- 13. Die Internet is 'n voorbeeld van 'n ..... bron as leerders ..... / The Internet is an example of a ..... source if learners .....**
1. primêre materiële; 'n onderwerp kan ondersoek. / *primary material; can explore topics on line.*
  2. sekondêre geskrewe; inligting kan opspoor vanaf aanlyn ensiklopedieë. / *secondary written; look up information from online encyclopaedias.*
  3. visuele primêre; blootgestel word aan geskandeerde dokumente van die verlede. / *visual primary; are exposed to scanned documents from the past.*
  4. primêre visuele; blootgestel word aan prente van die tydperk wat nagevors word. / *primary visual; are exposed to pictures of the time period investigated.*
- 14. Die nut van bronne in uitkomsgebaseerde onderwys is belangrik, want ... / The use of sources in outcomes-based education is important because ...**
1. onderrig met bronne maak temas meer duidelik. / *teaching with sources makes themes more clear.*
  2. bronne word gebruik as 'n onderrigstrategie sodat die leerders die verlede kan herkonstrueer. / *sources are used as a teaching strategy so that learners can reconstruct the past.*
  3. 'n handboek kan suksesvol gebruik word om meer bekend te raak met die inhoud. / *a textbook can be used successfully to get to know the content.*
  4. die verskillende vorme van bewyse help leerders om kennis te kry oor die verlede sowel as om vaardighede te kan onderskei en te interpreter. / *the different forms of evidence help learners to gain knowledge of the past as well as skills to distinguish and interpret.*
- 15. Primêre bronne is ... / Primary sources are ...**
1. eestehands. / *first hand.*
  2. oorspronklik. / *original.*
  3. altyd in geskrewe format. / *always in written format.*
  4. word hoofsaaklik gehuisves in argiewe, museums en privaat versamelings. / *mainly housed in archives, museums and private collections.*

**TOTAAL: 30**

## **ADDENDUM C**



**Requirements for this paper:**

Multi choice cards:

☒

Non-programmable calculator:

☐

Graphic paper:

☐

Laptop:

☐

Open book examination

☐

TOETS/  
TEST:

Mei 2006- Kwalifikasieprogram/  
Geskiedenis/May /Qualification Program:  
2006

B.Ed

*History*

MODULEKODE/  
MODULE CODE:

**LASW 111**

DUUR/

20 min

MODULE BESKRYWING/

**Leerarea Sosiale Wetenskappe**

DURATION:

MAKS / MAX: 30

MODULE DESCRIPTION:

**Learning Area Social Sciences**

EKSAMINATOR(E)/

LO de Sousa

DATUM

/ 22 Mei 2006

EXAMINER(S):

DATE:

MODERATOR:

PG Warnich

**MULTIKEUSE / MULTIPLE CHOICE (15x2=30)**

Kies uit elk van die volgende vrae ( Vraag 1 - 3 ) **EEN KORREKTE ITEM**. Skryf net die toepaslike nommer (1-4) teenoor die ooreenstemmende vraagnommer neer. / Choose from each of the following questions (Question 1 - 3 ) **ONE CORRECT ITEM**. Only write down the appropriate number (1-4) next to the corresponding question number.

1. **Demokrasie word wêreldwyd as 'n wonderwerk gesien omdat... / Democracy is regarded worldwide as a miracle because... (2)**
  1. al die politieke partye gehelp het om dit op te stel. / all the political parties helped to draft it.
  2. hierdie utopiese ideologie geen gebreke het nie. / this utopian ideology has no flaws.
  3. dit 'n bewys is dat 'n multi-etniese samelewing in harmonie kan saamwoon. / it is proof that a multi-ethnic society can live together in harmony.
  4. dit reeds vanaf 1994 in werking is. / it is in use since 1994.
2. **In 'n vry en demokraties land beteken openlikheid en deursigtigheid... / In a free and democratic land, openness and transparency means...(2)**
  1. publiek het nie toegang tot inligting nie. / public does not have access to information.
  2. burgers het nie toegang tot parlement nie. / citizens have no access to parliament.
  3. publiek mag statistiek en finansiële state van leiers bekom. / public may obtain statistics and financial statements of leaders.
  4. leiers mag geld ontvang vir werwing. / leaders may receive money for canvassing.
3. **Die drie kenmerkende vlakke van regering in Suid-Afrika is... / The three characteristic levels of government in South Africa are... (2)**
  1. Potchefstroom, Noord-Wes, Suid-Afrika. / Potchefstroom, North West, South Africa.
  2. burgemeester, premier, president. / mayor, premier, president.
  3. statsraad, magistraat, kabinet. / town council, magistrate, cabinet.
  4. plaaslik, provinsiaal, nasionaal. / local, provincial, national.

[6]

Kies uit elk van die volgende vrae ( Vraag 4 - 15 ) **EEN ITEM WAT NIE PAS NIE**. Skryf net die toepaslike nommer (1-4) teenoor die ooreenstemmende vraagnommer neer. / *Choose from each of the following questions (Question 4 - 15 ) the **ONE ITEM THAT DOES NOT FIT**. Only write down the appropriate number (1-4) next to the corresponding question number.*

4. **Kommunisme bestaan tans as volkstaatsideologie in die volgende lande: / Communism is currently a state ideology in the following countries: (2)**
  1. Laos en Viëtnam / Laos and Vietnam
  2. Noord-Korea en China / North Korea and China
  3. Kuba / Cuba
  4. Rusland / Russia
  
5. **Kenmerke van sosialisme. / Characteristics of socialism. (2)**
  1. Onstaan in verset teen kapitalisme. / Originated in reaction to capitalism.
  2. Vra vir meer eweredige verdeling van rykdom. / Asks for a more even distribution of wealth.
  3. Vakbonde word nie toegelaat nie. / Trade unions are not allowed.
  4. Skakel nie privaatbesit en -beheer uit nie. / Does not totally eliminate private possession and control.
  
6. **Kenmerke van 'n dictator is... / Characteristics of a dictator... (2)**
  1. sy politieke party beheer alle media van die land. / his political party controls all media in the country.
  2. gebruik 'n skrikbewind. / uses terror.
  3. regeer met beperkte mag. / rules with limited power.
  4. is nie onderhorig aan enige wegewende wette nie. / is not subject to any governing laws.
  
7. **Diktators van die 20ste en 21ste eeu is... / Dictators of the 20<sup>th</sup> and 21<sup>st</sup> century are... (2)**
  1. Adolf Hitler / Adolf Hitler
  2. Saddam Hussein / Saddam Hussein
  3. George W. Bush / George W. Bush
  4. Fidel Castro / Fidel Castro
  
8. **Ministers in die Parlement van 'n demokratiese land is aanspreeklik vir... / Ministers of Parliament in a democratic country are accountable to... (2)**
  1. landsburgers wat vir politieke partye gestem het van wie hulle verwag dat hulle by hul beloftes sal hou. / citizens who voted for them and who expect political parties to keep to their promises.
  2. landsburgers aan wie hulle moet terugrapporteer oor die gebeure in parlement. / citizens as they should report back on what is happening in parliament.
  3. hulle politieke partye. / their political parties.
  4. slegs dié landsburgers wat vir hulle party gestem het. / only the citizens who voted for their party.
  
9. **Verteenwoordiging is 'n belangrike kenmerk van Suid-Afrikase demokratiese bestel omdat... / Representation is an important characteristic of South Africa's democratic system because... (2)**
  1. die politieke partye is verteenwoordigend in die Nasionale Vergadering, dus verteenwoordig hulle 'n wye spektrum van politieke oortuigings. / the political parties are represented in the National Assembly, thus representing a wide range of political beliefs.
  2. eiers verteenwoordig die mense wat vir hulle gestem het. / leaders represent the people who voted for them.
  3. mense van die hele gemeenskap is verteenwoordigend in Parlement, bv. mense met liggaamsgebreke, verskillende etniese groepe en tale. / people from all walks of society are represented in Parliament, e.g. disabled, various ethnic groups and languages.
  4. landsburgers verteenwoordig hulself op 'n provinsiale vlak. / citizens represent themselves at a provincial level.

10. **Leemtes van 'n demokratiese regering sluit in... / Flaws of a democratic government include... (2)**
1. swak dienslewering. / *poor service delivery.*
  2. 65% meerderheidsstem. / *65% majority rule.*
  3. 'n grondwet wat teen die ekonomie van 'n land werk, bv. 'n maandelikse wettige werkstaking. / *a constitution that works against the economy of a country, e.g. a monthly legal worker's strike.*
  4. kiesers wat stem vir hul verteenwoordigers. / *voters who vote for their representatives.*
11. **Liberale demokratiese lande se burgers ervaar... / Liberal democratic countries' citizens experience (2)**
1. vryheid van uitdrukking, vryheid om te kan vergader en om individuele vryheid te kan geniet. / *freedom of expression, freedom to assemble and to enjoy freedom of the individual.*
  2. 'n afhanklike regterlike mag. / *a dependent judicial power.*
  3. 'n keuse van politieke partye. / *a choice of political parties.*
  4. beperkings op die mag van die regering. / *limits to the power of the government.*
12. **Kies die stelling wat nie waar is nie m.b.t. die demokratiese beginsel van stabiliteit in werkswyse. / Choice the statement that is not true with regard to the democratic principle of stability in procedure. (2)**
1. Die Kabinet oorweeg die wette wat voorgestel word. / *The Cabinet consider the laws that are proposed.*
  2. Die Nasionale Vergadering verteenwoordig die mense. / *The National Assembly represent the people.*
  3. Die Parlement van die land maak die wette. / *The Parlement of the country makes the laws.*
  4. Die hof se funksie is om die grondwet en ander wette te handhaaf. / *The court's function is to uphold the constitution and other laws.*
13. **Slawerny is teenstrydig met demokrasie omrede... / Slavery is contradictory to democracy due to... (2)**
1. dit menseregte ignoreer. / *it ignoring human rights.*
  2. dit onmenslike behandeling impliseer. / *it implying inhuman treatment.*
  3. dit neerkom op wetlike eiendom van mense. / *it comes down to legal ownership of humans.*
  4. dit geen beperking op beweging plaas nie. / *it placing no limitations on movement.*
14. **Sosial kwessies van ons tyd wat die ekonomie beïnvloed sluit in... / Social issues of our time that influence our economy include... (2)**
1. MIV/Vigs. / *HIV/ Aids.*
  2. armoede. / *poverty.*
  3. straatboewery. / *gangsters.*
  4. misdaad. / *crime.*
15. **Die MIV/Vigs virus gaan die volgende uitwerking op onderwys hê... / HIV/Aids is going to have the following effect on education... (2)**
1. minder ervare onderwysers. / *fewer experienced teachers.*
  2. meer werkseleenthede vir onderwysers. / *more job opportunities for teachers.*
  3. minder leerlinge teenwoordig by die skool. / *fewer learners present at school.*
  4. onbetaalde skoolgelde. / *unpaid school fees.*

[24]  
TOTAAL: 30

## **ADDENDUM D**

|                                            |                                                           |                                                  |  |
|--------------------------------------------|-----------------------------------------------------------|--------------------------------------------------|--|
| <b>Benodigdhede vir hierdie vraestel:</b>  |                                                           | <b>Oopboek-eksamen:</b> <input type="checkbox"/> |  |
| Multikeusekaarte: <input type="checkbox"/> | Nie-programmeerbare sakrekenaar: <input type="checkbox"/> |                                                  |  |
| Grafiekpapier: <input type="checkbox"/>    | Draagbare rekenaar: <input type="checkbox"/>              |                                                  |  |

|                                                                                                                                                                                                |                                                                                                                                                |                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>TOETS/</b><br><b>TEST:</b>                                                                                                                                                                  | Junie 2006- Geografie/June 2006<br><i>Geography</i>                                                                                            | <b>KWALIFIKASIEPR</b> <b>B.Ed</b><br><b>OGRAM/</b><br><b>/QUALIFICATION</b><br><b>PROGRAM:</b><br><b>DUUR/</b> 20 min<br><b>DURATION:</b><br><b>MAKS</b> / 30<br><b>MAX:</b> |
| <b>MODULEKODE/</b><br><b>MODULE CODE:</b><br><b>MODULE</b><br><b>BESKRYWING/</b><br><b>MODULE</b><br><b>DESCRIPTION:</b><br><b>EKSAMINATOR(E)/</b><br><b>EXAMINER(S):</b><br><b>MODERATOR:</b> | <b>LASW 111</b><br><br><b>Leerarea Sosiale Wetenskappe</b><br><b>Learning Area Social Sciences</b><br><br>LO de Sousa<br>CP van der Westhuizen | DATUM / 05 Junie 2006<br>DATE:                                                                                                                                               |

**MULTIKEUSE / MULTIPLE CHOICE                      (15x2=30)**

Kies uit elk van die volgende vrae ( Vraag 1 - 5 ) **EEN KORREKTE ITEM**. Skryf net die toepaslike nommer (onderskeidelik 1-4) teenoor die ooreenstemmende vraagnommer neer. / Choose from each of the following questions (Question 1 - 5 ) **ONE CORRECT ITEM**. Only write down the appropriate number (respectively 1-4) next to the corresponding question number.

1. Die negatiewe impak van tropiese ontbossing sal primêr nadelig wees vir die ... / *The negative impact of tropical deforestation will primarily be disadvantageous on the ...* (2)
  1. instandhouding van die globale suurstof en koolstof balans. / *maintenance of the global oxygen and carbon balance*
  2. globale klimaat in terme van temperatuur. / *global climate in terms of temperature.*
  3. verlies van betekenisvolle biodiversiteit. / *loss of significant biodiversity.*
  4. globale klimaat in terme van presipitasie. / *global climate in terms of precipitation*
  
2. Industrialisasie het 'n negatiewe impak op die Aarde se ekosisteme want dit... / *Industrialisation has a negative impact on Earth's ecosystems because it...* (2)
  1. het 'n hoë energie aanvraag t.o.v. die gebruik van fossielbrandstowwe en kernbrandstowwe. / *has a high energy demand that requires the use of fossil fuels and nuclear fuels.*
  2. gebruik landboutegnologie wat grond erosie verminder. / *utilises agricultural technology that decreases soil erosion.*
  3. verminder die behoefte vir beperkte hulpbronne. / *decreases the need for finite resources.*
  4. beperk die hoeveelheid emissie wat jaarliks geproduseer word. / *limits the amount of emissions produced each year.*
  
3. Herbenutting kan die gebruik van nie-hernieubare hulpbronne verleng, maar KAN dit NIE herstel NIE. / *Recycling can extend the use of non-renewable resources, but CANNOT restore them.* (2)
  1. Vals omdat industrialisasie ru-olie gebruik, natuurlike gas en steenkool as basis. / *False because industrialisation uses crude oil, natural gas and coal as its basis.*
  2. Waar omdat nie-hernieubare hulpbronne beperkte hulpbronne is. / *True because non-renewable resources are limited resources.*
  3. Waar omdat nie-hernieubare hulpbronne onbeperkte hulpbronne is. / *True because non-renewable resources are limitless resources.*
  4. Vals omdat nie-hernieubare bronne oor tyd herstel kan word. / *False because non-renewable resources can be restored over time.*

4. 'n Voorbeeld van 'n hernieubare hulpbronne wat energie kan verskaf is ... / *An example of a renewable resource that can supply energy is ...* (2)
  1. vullis. / *refuse.*
  2. kern energie. / *nuclear energy.*
  3. platinum. / *platinum.*
  4. fossielbrandstowwe. / *fossil fuels.*

5. **Nomadiese boere migreer lank voordat voedsel en water uitgeput raak in 'n gebied.**  
***Nomadic farmers migrate long before food and water is depleted in an area.*** (2)

1. Waar, omdat wetgewing in lande hulle vereis om dit te doen om konflik te vermy. / *True, because legislation in countries requires them to do so to avoid conflict.*
2. Waar, omdat hulle beweging bepaal is deur vyande en moontlike dominerende. / *True, because their movement is determined by enemies and possible domination.*
3. Waar, omdat swerwers net in bergagtige gebiede woon waar boerdery beperk is. / *True, because nomads live only in mountainous areas where farming is restricted.*
4. Waar, omdat hulle beweging afhanklik is van weiding- en waterbeskikbaarheid wat hulle seisoenaal laat migreer. / *True, because their movement is dependent on grazing and water availability that allows them to migrate seasonally.*

Kies uit elk van die volgende vrae ( Vraag 6 - 15 ) **EEN ITEM WAT NIE PAS NIE.** Skryf net die toepaslike nommer (onderskeidelik 1-4) teenoor die ooreenstemmende vraagnommer neer. / **Choose from each of the following questions (Question 6 - 15 ) the ONE ITEM THAT DOES NOT FIT.** Only write down the appropriate number (respectively 1-4) next to the corresponding question number.

6. 'n Volhoubare lewensonderhoudende dorp het die volgende kenmerke ...

***A sustainable life-supporting town has the following characteristics ...*** (2)

1. landbouvertraging. / *agricultural delay.*
2. hernieubare energiebronne. / *renewable energy sources.*
3. omgewingsvriendelike en energie-doeltreffende geboue. / *environmentally friendly and energy efficient buildings.*
4. entrepreneurskap. / *entrepreneurship.*

7. **Hulpbron bestuur in die tropiese woude is belangrik omdat ... / *Resource management in the tropical forests is important because ...*** (2)

1. gronderosie in tropiese gebiede nie versnel wanneer die reënwood verwyder word nie. / *Soil erosion in tropical areas is not accelerated when the rainforest is removed.*
2. ontbossing kan lei tot gronderosie en grondverskuiwings. / *Deforestation can lead to ground erosion and mass movement.*
3. sedimente in riviere die rivier se ekosisteem versteur en vis spesies laat vrek. / *Sediments in rivers can disturb the river ecosystem and fish species can die.*
4. sedimente in riviere lei tot verminderde kanaalkapasiteit en vloede. / *Sediments in rivers can lead to reduced canal capacity and floods.*

8. **Hulpbronbestuur is belangrik vir tropiese woude want ...**

***Resource management is important for tropical forests as ...*** (2)

1. woude verskaf 'n habitat vir honderde bedreigde spesies. / *forests provide a habitat for hundreds of threatened species.*
2. woude word vinniger uitgeput as wat dit hernuwe word. / *forests are being depleted faster than they regenerate.*
3. woude is skaars en moet bewaar word. / *forests are limited and must be conserved.*
4. woude is nie-hernieubaar. / *forests are non-renewable.*

9. **Volhoubare ontwikkelingsaktiwiteite voldoen aan ...**  
***Sustainable development activities satisfy ... (2)***
1. aktiwiteite wat die natuurlike hulpbronne verniel. / *activities that destroy the natural resources.*
  2. aktiwiteite wat die natuurlike hulpbronne nie beskadig nie. / *activities that do not damage the natural resources.*
  3. aktiwiteite wat sommige natuurlike hulpbronne beskadig, maar 'n positiewe uitwerking op ander natuurlike hulpbronne het. / *activities that destroy some of the natural resources, but have a positive outcome on the natural resources.*
  4. aktiwiteite wat nie die natuurlike hulpbronne verniel nie. / *activities that do not destroy the natural resources.*
10. **Hulpbronne is natuurlike materiale wat ... / Resources are natural materials that ... (2)**
1. 'n nut en waarde het vir die mens. / *have a use and value for humans.*
  2. bestaan uit materie en enrgie hulpbronne. / *consist of matter and energy resources.*
  3. vleilande en graslande insluit. / *include wetlands and grasslands.*
  4. nie deel vorm van die ekosisteem nie. / *do not form part of the ecosystem.*
11. **Die voordele van 'n dam sluit in ... / The advantages of a dam include ... (2)**
1. vloedvoorkoming. / *flood prevention.*
  2. die vermindering van sediment en voedingstowwe stromaf. / *the reduction of sediments and nutrients downstream.*
  3. opwekking van elektrisiteit. / *generation of electricity.*
  4. regulering van watertoevoer. / *water supply regulation.*
12. **Vestigingspatrone van die bevolking in Suid-Afrika is beïnvloed deur ... / Settlement patterns of the South African population are influenced by the ... (2)**
1. Geografiese faktore. / *Geographic factors.*
  2. natuurlike hernieubare hulpbronne. / *natural renewable resources.*
  3. kultuur van die mense. / *culture of the people.*
  4. natuurlike nie-hernieubare hulpbronne. / *natural non-renewable resources.*
13. **Die woord volhoubaar beskryf ... / The word sustainable describes ... (2)**
1. geen uitputting van die omgewingskapitaal. / *no depletion of the environmental capital.*
  2. 'n onbeperkte tyd vir hulpbron uitputting. / *a unlimited time for resource depletion.*
  3. ekologiese volhoubaarheid. / *ecological sustainability.*
  4. die natuurlike hulpbronne waarvan die huidige en toekomstige ekonomiese groei en lewe afhanklik is en wat nie uitgeput en degradeer moet word nie. / *the natural resources of which the current and future economic growth and life is dependent, that must not be exhausted and degraded.*
14. **Biomassa-energie is... / Biomassa energy ... (2)**
1. 'n goeie plaasvervanger van petrol omdat dit nie die lug besoedel nie. / *is a good replacement for petrol as it does not pollute the air.*
  2. afkomstig van onder andere mis en verrotte plantmateriaal. / *originates amongst others from manure and rotting plant matter.*
  3. afkomstig van gebergte son-energie in plante en diere. / *originates from stored solar energy in plants and animals.*
  4. 'n voorbeeld van 'n hernieubare energie hulpbron. / *an example of renewable energy resource.*
15. **Hernieubare hulpbronne ... / Renewable resources ... (2)**
1. is vervangbaar binne goeie bestuursondernemings. / *are replaceable within good management enterprises.*
  2. word nie-herniebaar wanneer plant en dier spesies uitsterf. / *become non-renewable when plant and animal resources become extinct.*
  3. word nie-herniebaar wanneer plant- en dierspesies hulself vervang. / *become non-renewable when plant and animal resources replace themselves.*
  4. is vervangbaar binne die natuurlike ekologiese siklusse. / *are replaceable within the natural ecological cycle.*

**TOTAAL/TOTAL: 30**

## **ADDENDUM E**



**Requirements for this paper:**

Multi choice cards: ☐  
Graphic paper: ☐

Non-programmable calculator: ☐  
Laptop: ☐

Open book examination ☐

EKSAMEN/  
EXAMINATION:

**Maart Semestertoets / Kwalifikasieprogram /**  
**March Semester Test / Qualification Program:**

B.Ed

MODULEKODE/  
MODULE CODE:

**LASW 111**

DUUR/ 1 UUR/ 1  
DURATION: HOUR

MODULE BESKRYWING/  
MODULE DESCRIPTION:

**Leerarea Sosiale Wetenskappe /**  
**Learning Area Social Sciences**

MAKS / MAX: 60

EKSAMINATOR(E)/  
EXAMINER(S):

LO de Sousa

DATUM / 29 Maart/

DATE: March 2006

TYD / TIME: 18:00-19:00

MODERATOR:

CP van der Westhuizen  
PG Warnich

**AFDELING A / SECTION A**

**MULTIKEUSE / MULTIPLE CHOICE**

(6x2=12)

Kies uit elk van die volgende vrae ( Vraag 1 - 3 ) **EEN KORREKTE ITEM**. Skryf net die toepaslike nommer (1-4) teenoor die ooreenstemmende vraagnummer neer. / Choose from each of the following questions (Question 1 - 3 ) **ONE CORRECT ITEM**. Only write down the appropriate number (1-4) next to the corresponding question number.

1. 'n Gemeenskap van plante en diere waar daar wiselwerking tussen mekaar en die nie-lewende omgewing is. / A community of plants and animals interacting with one another and the nonliving environment.
  1. Fotosintese / Photosynthesis
  2. Habitat / Habitat
  3. Nis / Niche
  4. Ekosisteem / Ecosystem
2. 'n Trofiese vlak is ... / A trophic level is ...
  1. 'n stadium in die voedselketting wat die hoeveelheid keer wat energie oorgedra is deur voeding reflekteer. / a stage in the food chain that reflects the number of times energy has been transferred through feeding.
  2. net van fotosintese afhanklik. / dependent only on photosynthesis.
  3. 'n skakel in die biosfeer. / a link in the biosphere.
  4. 'n skakel in die voedselketting wat verseker dat ontbinding plaasvind. / a stage in a food chain that ensures decomposition takes place.
3. Die wetlik en sosiale sisteem wat in die Middeleeuse Europa bestaan het, waar 'n vasal ('n onderdaan) 'n heer se grond besit het in ruil vir militêre diens. / The legal and social system that existed in Medieval Europe, in which a vassal (a subordinate) possessed a lord's land in exchange for military service.
  1. Renaissance / Renaissance
  2. Kolonialisme / Colonialism
  3. Feodalisme / Feudalism
  4. Humanisme / Humanism

Kies uit elk van die volgende vrae ( Vraag 4 - 6 ) **EEN ITEM WAT NIE PAS NIE**. Skryf net die toepaslike nommer (1-4) teenoor die ooreenstemmende vraagnommer neer. / Choose from each of the following questions (Question 4 - 6) the **ONE ITEM THAT DOES NOT FIT**. Only write down the appropriate number (1-4) next to the corresponding question number.

4. Onvoldoende water vir huishoudelike higiëne lei tot die volgende siektes: / *Insufficient water for domestic hygiene leads to the following diseases:*

1. Diarree / *Diarrhoea*
2. Oog-infeksies / *Eye infections*
3. Velsiektes / *Skin diseases*
4. Luise en vlooie / *Lice and fleas*

5. 'n Argief is ... / *An archive is ...*

1. 'n versameling dokumente, byvoorbeeld briewe, amptelike geskrifte, of foto's wat bewaar word vir hul historiese belang. / *a collection of documents, for example letters, official papers, or photographs, kept for their historical interest.*
2. 'n plek (gebou of kamer) wat 'n argief huisves. / *a place (building or room) that houses archives.*
3. 'n plek waar boeke volgens 'n verwysingskode gehou word vir navorsing. / *a place where books are kept for research according to a reference code.*
4. die bergplek van publieke rekords en historiese dokumente. / *a place where public records and historical documents are stored.*

6. Die Renaissance was 'n periode in Europa se geskiedenis wat ... / *The Renaissance was 'n period in European history that ...*

1. begin het in Italië met die oplewing van kritiese denke. / *began in Italy with the revival of critical ways of thought.*
2. beklemtoon onderdanigheid as meer belangrik as menseregte en individualiteit. / *emphasised subordination as more important to human rights and individualism.*
3. beklemtoon humanisme as 'n sentrale tema. / *emphasised humanism as a central theme.*
4. bevraagteken die idees in kuns, godsdiens en wetenskap. / *questioned the ideas in art, religion and science.*

## AFDELING B / SECTION B

### VRAAG 1 / QUESTION 1

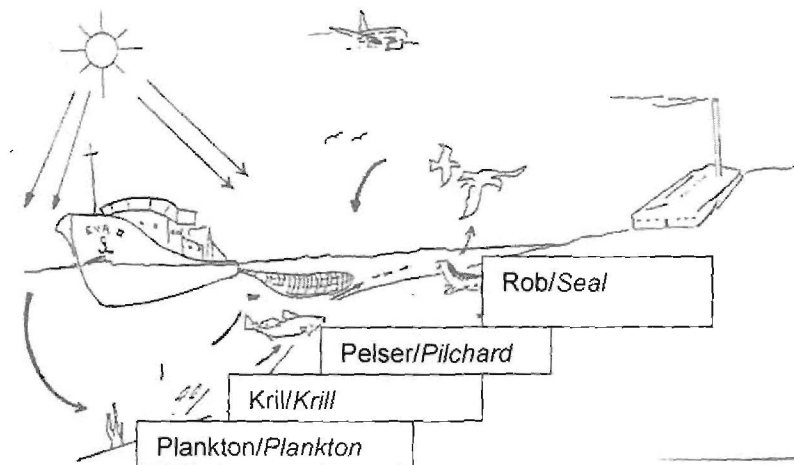
- 1.1 Verduidelik wat die studie van die Leerarea Sosiale Wetenskappe behels. / *Explain what the study of the Learning Area Social Sciences entails.* (4)
- 1.2 Noem en bespreek 'n vaardigheid en houding wat deel uitmaak van die Leeruitkomst van Geografie of Geskiedenis binne die Leerarea Sosiale Wetenskappe. / *Name and discuss a skill and attitude that forms part of the Learning Outcome of teaching Geography or History within the Learning Area Social Sciences.* (2+2=4)

### VRAAG 2 / QUESTION 2

- 2.1 Noem die primêre bron van energie vir die ekosisteem in Figuur 1 en verduidelik hoedat seegras van die son energie gebruik maak. / *Name the primary source of energy for the ecosystem in Figure 1 and explain how sea grass makes use of the solar energy.* (2)
- 2.2 Beskryf die nis van die Pelser in Figuur 1. / *Describe the niche of the Pilchard in Figure 1.* (2)
- 2.3.1 Teken 'n voedselpiramide om outotrofe en heterotrofe volledige te illustreer soos te sien is in Figuur 1. Gebruik Figuur 1 om jou te help om die organismes te identifiseer in elk van die trofiese vlakke wat jy op die voedselpiramide moet identifiseer. / *Draw a food pyramid to fully illustrate the autotroph and heterotrophs as seen in Figure 1. Use the food chain in Figure 1 to help you identify the organisms in each trophic level that you must identify on the food pyramid.* (4)

2.3.2 Verduidelik wat 'n voedselpiramide voorstel. / Explain what a food pyramid represents. (2)

2.3.3 Verduidelik hoe die see-ekosisteem in Figuur 1 ontwrig kan word. / Discuss how the sea ecosystem in Figure 1 can be disrupted. (4)



Figuur 1 'n See-ekosisteem / Figure 1 A sea ecosystem

### VRAAG 3 / QUESTION 3

3.1 Verduidelik hoe verstedliking en landbou die boustene van die biosfeer kan laat verbrokkel. / Explain how urbanisation and farming can deteriorate the building blocks of the biosphere. (3)

3.2 Bespreek 'n skoolprojek wat jy kan inisieer om die gesondheidstoestande van 'n informele nedersetting naby jou skool te verbeter. / Discuss a school project you can initiate to improve health conditions in an informal settlement near your school. (3)

### VRAAG 4 / QUESTION 4

4.1 Verduidelik met motivering TWEE belangrike voordele wat jy as 'n onderwyser in Afrika belangrik sal beskou vir die toekoms van jou leerlinge wanneer jy oor Afrika Renaissance dink. / Explain with motivation TWO advantages that you as a teacher in Africa regard as important for the future of your learners when you think about African Renaissance. (4)

4.2 Verduidelik hoe jy Afrika Renaissance sal implementeer sou jy as die President van die Afrika Unie verkies word. / Discuss how you would implement African Renaissance, if you were to be elected as the African Union's President. (4)

### VRAAG 5 / QUESTION 5

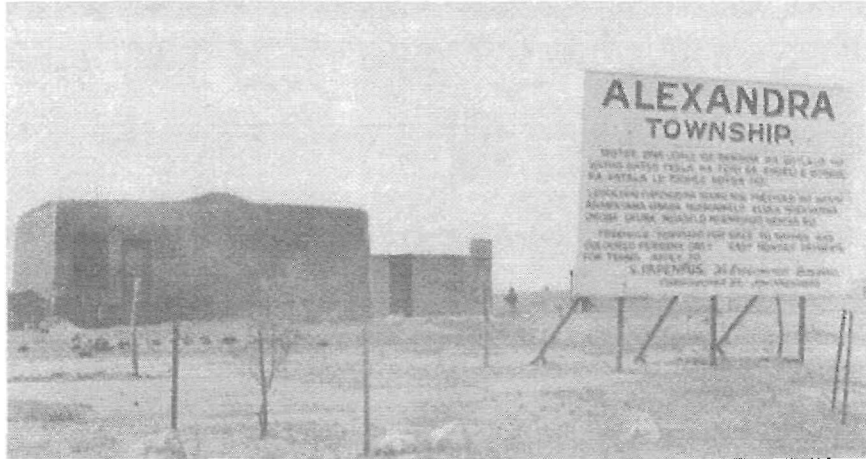
5.1 Definieer wat is 'n primêre materiële bron. / Define what is a primary material source. (3)

5.2 Verduidelik met behulp van 'n voorbeeld wat jy verstaan 'n sekondêre materiële bron is. / Explain with the aid of an example what you understand a secondary material source is. (3)

5.3 Identifiseer die aard en tipes bronne wat volg, (bv. Sekondêre, mondelinge bron). / Identify the nature and type of the sources that following, (e.g. Secondary, oral source).

5.3.1 Figuur 2. / Figure 2.

(2)



Figuur 2 'n Foto van Alexandra township (dorpsgebied) wat geneem is gedurende die 1950's. /  
Figure 2 A photo of Alexandra township that was taken during the 1950s.

5.3.2 'n Lesing deur 'n historikus van 'n universiteit oor Shaka. / A lecture by a university historian about Shaka. (2)

5.4 Verduidelik watter nut bronne vir Geskiedenisonderwysers inhou wanneer hulle Geskiedenis onderrig. / Explain the use of sources for History teachers when teaching History. (2)

**TOTAAL: 60**

## **ADDENDUM F**



**Requirements for this paper:**

Multi choice cards: ☐

Non-programmable calculator: ☐

Graphic paper: ☐

Laptop: ☐

Open book examination ☐

EKSAMEN/  
EXAMINATION:

JUNIE 2006 (EERSTE KWALIFIKASIEPROGRAM/  
GELEENTHEID) /QUALIFICATION PROGRAM:

**B.ED**

MODULEKODE/  
MODULE CODE:

**LASW 111**

DUUR/ 90 MIN

DURATION:

MODULE BESKRYWING/ LEERAREA SOSIALE WETENSKAPPE  
MODULE DESCRIPTION:

MAKS / MAX: 80

EKSAMINATOR(E)/  
EXAMINER(S):

LO DE SOUSA

DATUM / 13/06/2006

DATE:

TYD / TIME: 14:00-15:30

MODERATOR:

CP VAN DER WESTHUIZEN  
PG WARNICH

**BEANTWOORD AL DIE VRAE. / ANSWER ALL THE QUESTIONS.**

**VRAAG 1 (MULTIKEUSE) / QUESTION 1 (MULTIPLE CHOICE)**

Kies uit elk van die volgende vrae ( Vraag 1.1 – 1.6 ) **EEN KORREKTE ITEM**. Skryf net die toepaslike letter (A-D) teenoor die ooreenstemmende vraagnommer neer. / Choose from each of the following questions (Question 1.1 – 1.6 ) **ONE CORRECT ITEM**. Only write down the appropriate letter (A-D) next to the corresponding question number.

1.1 Die verhoging van skoorstene om plaaslike lugbesoedeling te verminder in industriële gebiede en rondom kragstasies \_\_\_\_\_ die bron van besoedeling en verwante suurreën. / Raising the height of smokestacks to reduce local pollution in industrial areas and around power plants \_\_\_\_\_ the source of the pollution relative to acid rain. (2)

- A. verminder / decreases
- B. maak geen verskil nie / makes no difference to
- C. vermeerder / increases
- D. neutraliseer / neutralises

1.2 Industrialisasie het tot gevolg die volgende situasies wat vore kom... / Industrialisation results in the following situations arising... (2)

- A. suurreën beskadig mere, visse en grond maar het geen beduidende impak op onderskeidelik natuurlike plantegroei of oeste. / acid rain damages lakes, fish, and soils, but has no significant impact upon either natural vegetation or crops.
- B. suurreën in die Noordelike Hemisfeer ontstaan in plekke van geïndustrialiseerde stede. / acid rain in the Northern Hemisphere originates in locations in the industrialised cities.
- C. verminder die behoefte vir nie herwinbare bronne. / a decrease in the need for non-renewable resources.
- D. beperk die hoeveelheid emissie wat jaarliks produseer word. / limits the amount of emissions produced each year.

- 1.3 Die negatiewe impak van tropiese reënwoorde, sou watter van die volgende dele meer ongunstig affekteer? / *The negative impact of tropical deforestation, would most adversely affect which of the following?* (2)
- A. Handhawing van die globale suurstof- en koolstofbalans. / *Maintenance of the global oxygen and carbon balance.*
  - B. Globale klimaat in terme van temperatuur. / *Global climate in terms of temperature.*
  - C. Verlies aan beduidende aspekte van biodiversiteit. / *Loss of significant aspects of biodiversity.*
  - D. Globale klimaat in terme van presipitasie. / *Global climate in terms of precipitation.*

- 1.4 Verbranding van sekere vorme van vullis kan 'n afval-tot-energie opsie was. / *Incineration of certain forms of refuse can be a waste-to-energy option.* (2)

- A. Waar, omdat dit 'n toekomstige bron van nie-hernieubare energie. / *True, because it is a future source of non-renewable energy.*
- B. Waar, omdat dit 'n hernieubare bron van energie is. / *True, because it is a renewable source of energy.*
- C. Waar, omdat afval nie-toksies is. / *True, because waste is non-toxic.*
- D. Waar, omdat die verbranding van vullis nie besoedelend is nie. / *True, because the incineration of refuse is non-pollutant.*

- 1.5 Politiek streef \_\_\_\_ daarna om Kapitalisme deur middel van 'n proletariese revolusie omver te gooi om so 'n klaslose samelewing tot stand te bring.

*Politically \_\_\_\_ strives to overthrow Capitalism through a proletariat revolution to therefore achieve a classless society.* (2)

- A. Demokrasie / *Democracy*
- B. Sosialisme / *Socialism*
- C. Kommunisme / *Communism*
- D. Kapitalisme / *Capitalism*

- 1.6 Die vlakke van regering van die Republiek van Suid-Afrika is... / *The levels of governance in the Republic of South Africa are...* (2)

- A. Plaaslik (Munisipaal); Provinsiaal; Nasionaal (Parlement-Kaapstad/Kabinet-Pretoria/Howe-Bloemfontein en Johannesburg). / *Local (Municipal); Provincial; National (Parliament- Cape Town/Cabinet-Pretoria/Courts-Bloemfontein and Johannesburg).*
- B. Plaaslik (Premier); Provinsiaal; Nasionaal (President). / *Local (Premier); Provincial; National (President).*
- C. Parlement-Kaapstad; Kabinet-Pretoria; Howe-Bloemfontein en Johannesburg. / *Parliament- Cape Town; Cabinet-Pretoria; Courts-Bloemfontein and Johannesburg.*
- D. Plaaslik (Munisipaal); Provinsiaal (Burgemeester); Kabinet(President). / *Local (Municipal); Provincial (Mayor); Cabinet (President).*

Kies uit elk van die volgende vrae ( Vraag 1.7 – 1.10 ) **EEN ITEM WAT NIE PAS NIE**. Skryf net die toepaslike letter (A-D) teenoor die ooreenstemmende vraagnommer neer. / *Choose from each of the following questions (Question 1.7 – 1.10 ) the **ONE ITEM THAT DOES NOT FIT**. Only write down the appropriate letter (A-D) next to the corresponding question number.*

- 1.7 Water is 'n... / *Water is a...* (2)

- A. Hernieubare hulpbron wat in oorvloed in die hidrosfeer gevind word. / *Renewable resource that is found in abundance in the hydrosphere.*
- B. Nie-hernieubare hulpbron omdat dit besoedel is. / *Non-renewable resource due to it being polluted.*
- C. Natuurlike hulpbron wat van groot waarde is vir die mensdom. / *Natural resources that is of great value to humanity.*
- D. Hernieubare hulpbron wat fisies in die omgewing voorkom. / *Renewable resource that is physically found in the environment.*

**1.8 Die beskerming van rekords in 'n argief behels... / The protection of records in an archive involves... (2)**

- A. die bewaring van waardevolle sekondêre bronne soos notuleboeke in 'n kluis. / *The preservation of valuable secondary sources like minute books in a safe.*
- B. klimaatbeheer. / *climate control.*
- C. die beskerming van bronne teen stof, water, vuur, hitte, ens. / *the protection of sources against dust, water, fire, heat, etc.*
- D. die bewaring van rekords vir 500 jaar en langer. / *the preservation of records for 500 years and longer.*

**1.9 Kenmerke van demokrasie. / Characteristics of democracy. (2)**

- A. Almal het die reg om vir 'n politieke party van sy keuse te stem. / *Everyone has the right to vote for a political party of their choice.*
- B. Berus op die teorieë van Karl Marx en Friedrich Engels. / *Founded on the theories of Karl Marx and Friedrich Engels.*
- C. Politieke leiers moet rekenskap gee van hulle optrede aan die mense wat vir hulle gestem het. / *Political leaders must account for their actions to the people who voted for them.*
- D. Die regsmag word deur verskillende afdelings van die regering gedeel. / *The power of the law is divided according to the different departments of the government.*

**1.10 Indirekte demokrasie beteken dat... / Indirect democracy means that... (2)**

- A. gedurende 'n verkiesing, die massas stem vir hulle verteenwoordigers. / *during an election, the masses vote for their representatives.*
- B. referendums laat toe dat die publiek besluit neem. / *referendums allow the public to decide.*
- C. die populasie van 'n land neem saam besluite. / *the population of a land decide together.*
- D. alle burgers ouers as 18 jaar mag stem vir die politieke party van sy keuse. / *all the citizens older than 18 years may vote for the political party of their choice.*

[10x2=20]

**VRAAG 2 (GEOGRAFIE) / QUESTION 2 (GEOGRAPHY)**

- 2.1 Verduidelik hoe die waarde van 'n natuurlike hulpbron soos suikerriet, mis of landbou afval (biomassa) deur die mens bepaal word. / *Explain how the value of a natural resource like sugarcane, manure or agricultural waste (biomass) can be determined by mankind.* (4)
- 2.2 Tref 'n onderskeid tussen hernieubare en nie-hernieubare energiehulpbronne deur kortliks elkeen te definieer en twee voorbeelde van elk te gee. / *Distinguish between renewable and non-renewable energy resources by briefly defining each one and give two examples of each.* (4)
- 2.3 Skryf kortliks hoe jy wind en water, as voorbeelde van hernieubare energiehulpbronne, met behulp van voorbeelde sal beskryf aan graad nege leerlinge. / *Write briefly how you will describe wind and water, as examples of renewable energy resources, with the help of examples to grade nine learners.* (6)
- 2.4 Riviere, minerale en klimaat, onder andere bepaal, die vestigingspatrone van mense in Suid-Afrika. Evalueer die geldigheid van hierdie stelling en verskaf voorbeelde in jou antwoord. / *Rivers, minerals and climate, amongst others, determine the settlement patterns of people in South Africa. Evaluate the validity of the statement by providing examples in your answer.* (6)
- 2.5.1 Identifiseer TWEE tropiese woude in die wêreld waar grootskaalse ontbossing plaasvind. / *Identify TWO tropical forests in the world where large-scale deforestation occurs.* (2)
- 2.5.2 Verduidelik onder watter omstandighede inwoners van 'n tropiese woud volhoubaar sal kan oorleef. / *Explain under what circumstances will residents of a tropical forest be able to survive sustainably.* (4)

- 2.5.3 Beskryf hoe jy 'n volhoubare dorp sal laat funksioneer deur die komponente van volhoubare ontwikkeling te omskryf. / *Describe how you will allow a sustainable town to function by describing the components of sustainable development.* (4)  
[30]

**VRAAG 3 (GESKIEDENIS) / QUESTION 3 (HISTORY)**

- 3.1 'n Berig in die Beeld van 22 Maart 2006 het vermeld dat 14 ministers en adjunk-ministers direkteure van private, publieke of nie-winsgewende maatskappye is, maar versuim het om hul belange in die parlement se bateregister vir 2005 te verklaar. Me. Naledi Pandor, Minister van Onderwys, is volgens die registrateur steeds direkteur van 'n maatskappy. Volgens haar woordvoerder het sy by dié maatskappy bedank en die Ouditeur Generaal daarvan ingelig. / *A report in the Beeld on the 22 March 2006 stated that 14 minister and deputy ministers are directors of private, public or non-profit companies, but neglected to declare their interests in parliament's asset register for 2005. Ms. Naledi Pandor, Minister of Education, is still director of a company according to the registrar. According to her spokesperson she has resigned from the company and has informed the Auditor General.*
- 3.1.1 Noem die VYF kenmerke van 'n demokratiese bestel. / *Name the FIVE characteristics of a democratic dispensation.* (5)
- 3.1.2 Volgens die nuusberig, verduidelik en motiveer of die Minister van Onderwys Openlikheid en Deursigtigheid beoefen het. / *According to the news report, explain and motivate whether the Minister of Education practised Openness and Transparency.* (4)
- 3.2 Gee jou eie verduideliking (gebruik sketse waar nodig) om die werking van die demokratiese kenmerke van magsdeling en stabiliteit in Suid-Afrika prakties te illustreer. / *Give your own explanation (use a sketch where necessary) as to how the democratic characteristics of power sharing and stability in procedure can be to practically illustrate in South Africa.* (8)
- 3.3 Gebruik Suid-Afrika as voorbeeld en verduidelik met motivering die leemtes van 'n demokraties regering. / *Use South Africa as example and explain with motivation the flaws of a democratic government.* (5)
- 3.4 Watter een van die twee ideologieë, sosialisme of kommunisme, sal jy voor stem? Motiveer jou keuse deur die twee ideologieë te bespreek en die implikasies van elk op jou lewe te noem. / *Which one of the two ideologies, socialism or communism, will you vote for? Motivate your choice by discussing the two ideologies and name the implications of each on your own life.* (8)

[30]

**TOTAAL/TOTAL: [80]**

## **ADDENDUM G**

## Faculty of Educational Sciences

### LASW 111

#### MINIMUM SYSTEM REQUIREMENTS:

Windows 95, 98, NT, 2000 or XP  
Microsoft Internet Explorer 5.0 or later  
Microsoft Media Player 6.4 or later  
Pentium processor (minimum 133Mhz)  
128 MB RAM  
DVD-ROM and sound card

#### DVD Player

#### How to use the DVD/ DBS:

Put the DVD disk into the portable DVD player and switch in on. The DVD will start automatically. Use the navigation buttons (up, down, left and right) to explore *all the possibilities on each menu*. Press the "OK" or "select" button on the remote to select (activate) a button on each menu.

If you experience any problems with the use of the DVD/ DBS please ask Me. De Sousa (018 299 1745 or office no. 229 P.O.K. Main building) for assistance .

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YUNIBESITI YA BOKONE-BOPHIRIMA  
NORTH-WEST UNIVERSITY  
NOORDWES-UNIVERSITEIT

## Faculty of Educational Sciences

LASW 111

LASW 111

Potchefstroom Campus

## **ADDENDUM H**



## **ADDENDUM I**



## **ADDENDUM J**



## **ADDENDUM K**



## **ADDENDUM L**



## **ADDENDUM M**



## **ADDENDUM N**



## **ADDENDUM O**



## **ADDENDUM P**

**Luiza de Sousa - Request of approval**

---

**From:** "Iona Beukes" <IonaB@etv.co.za>  
**To:** <smslods@puknet.puk.ac.za>  
**Date:** 12/20/2005 12:28 PM  
**Subject:** Request of approval

---



Dear Luiza

We thank you for your e-mail. It gives us great pleasure to inform you that our Channel Director has approved the use of our material. She would like us to thank you for obtaining our permission first. We do appreciate this.

Thank you for making 'e' your channel of choice!

Sincerely,  
Iona Beukes  
Customer Care Manager

-----Original Message-----

**From:** Luiza de Sousa [mailto:SMSLODS@puknet.puk.ac.za]  
**Sent:** 15 December, 2005 11:34 AM  
**To:** Info  
**Subject:** Request of approval

To Whom It May Concern/Nora Moerat

I would like permission to use short excerpts of primary and secondary Historical sources that I recorded over the last few years from the e-tv. It is from the News and from reports about the pass laws and

forced removals, etc.

My request is to use this footage for educational purposes at the North-West University where I lecture. I would like to copy the footage onto a DVD so that my students can use the multimedia to study from and so help in my research that concerns learner-centred learning and learning using visuals, text, etc., using a portable DVD player within the Learning Area Social Sciences. The visuals do show the e-tv logo on the screen, but I will acknowledge that the visuals were obtained from the e-tv.

I kindly request that you inform me on your decision concerning my request.

I hope that my request finds favour with you.

Yours truly

Luiza de Sousa

Vriendelike groete/Kind regards

Ms Luiza O. de Sousa

Dosent: Departement Sosiale Wetenskappe/Lecturer: Department of Social Sciences Skool vir Onderwyseropleiding (Mensgerigte Skoolvakke)/School for Teacher Training (Human oriented school subjects)  
Noordwes-Universiteit (Potchefstroomkampus)/North-West University (Potchefstroom Campus)

-----

Tel: (018) 299 1745

E-pos: smslods@puknet.puk.ac.za

## **ADDENDUM Q**

**From:** Luiza de Sousa  
**To:** Barnardo, Danie  
**Date:** 12/12/2005 11:09:23 AM  
**Subject:** Re: Permission to use part of Geoscience video

Dear Danie

Thank you very much for the permission. I will definately acknowledge the source.

Best wishes for a very happy Christmas and prosperous new year.

Regards  
 Luiza

>>> Danie Barnardo <barnardo@geoscience.org.za> 12/12/2005 11:03 AM >>>  
 Dear Luiza,

I am very glad that somebody can use these videos! You are most welcome to use some of the footage, provided that you acknowledge the source *prominently*.

All the best with your teaching and all the best for 2006.

I wish you a blessed Christmas.

Kind regards

Danie Barnardo  
 Council for Geoscience

Luiza de Sousa wrote:

>Dear Sir

>

>My name is Luiza de Sousa. About three years ago the Council for Geoscience sent me a series of videos and posters. I used these with great success in my lessons. These were excellent resources and were enjoyed by my learners. I am now lecturing at the North-West University and would like permission to use some footage from your videos. I am busy with my planning for 2006 and foresee that i might use about 5 minutes of the video on a CD or DVD that i am planning to make to give to my first year students as a multimedia resource for their teaching and learning. I need your permission that i may use this footage for educational purposes.

>

>I hope that my request will meet your approval.

>

>Regards

>Luiza de Sousa

>

>Vriendelike groete/Kind regards

>

>Ms Luiza O. de Sousa

>Dosent: Departement Sosiale Wetenskappe/Lecturer: Department of Social Sciences

>Skool vir Onderwyseropleiding (Mensgerigte Skoolvakke)/School for Teacher Training (Human oriented school subjects)

>Noordwes-Universiteit (Potchefstroomkampus)/North-West University (Potchefstroom Campus)

>

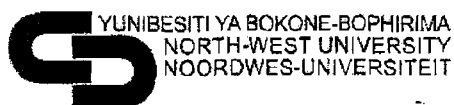
>Tel: (018) 299 1745

>E-pos: [smslods@puknet.puk.ac.za](mailto:smslods@puknet.puk.ac.za)

>

>Hierdie boodskap (en aanhangsels) is onderhewig aan beperkings en 'n vrywaringsklousule. Volledige besonderhede beskikbaar by <http://www.puk.ac.za/itb/e-pos/disclaimer.html> , of by [itbsekr@puknet.puk.ac.za](mailto:itbsekr@puknet.puk.ac.za).

## **ADDENDUM R**



YUNIBESITHI YA BOKONE-BOPHIRIMA  
NORTH-WEST UNIVERSITY  
NOORDWES-UNIVERSITEIT

North-West University  
Potchefstroom Campus  
Private Bag X6001  
Potchefstroom  
2520  
Tel: 018 299 1745  
2006-01-11

Dear Dr Golightly

#### Research study permission

As the acting director, you are aware, that I am currently registered as a Masters (MEd) student at the North West University in Teaching and Learning (University number 10848509).

I am planning to study *The integration of Digital Video Discs (DVDs) and multimedia in the Learning Area Social Sciences* with profs B.W. Richter and C. Nel as my promoters.

The aims of the study are to determine:

- How one can integrate ICT, specifically the DVD, into the teaching and learning of the Learning Area Social Sciences.
- What type of multimedia resources can be used to the benefit of student learning within the Learning Area Social Sciences.
- What the structure and format of the multimedia on the DVD should look like to achieve selected learning outcomes within the Learning Area Social Sciences.

In order to test and confirm the assumption that *the integration of ICT, specifically the DVD, using different multimedia in teaching and learning can be beneficial to LASS students at tertiary level*, and to benefit further research in my field of specialisation namely the Learning Area Social Sciences, I require the use of the first year compulsory LASW 111 students.

The request is for permission to provide the learners with DVDs and portable players, which will be, used for two Geography and two History lectures. The learners will receive feedback regarding the theme presented in the DVD lecture and can ask questions during the following contact session. Their marks are in no way to be compromised.

I would also like to inform you that the literature study undertaken has revealed that teaching with multimedia is beneficial to teaching and learning.

Yours faithfully

Miss LO de Sousa

Lecturer: Department of Social Sciences



POTCHEFSTROOM CAMPUS  
Private Bag X6001, Potchefstroom, South Africa, 2520  
Tel: (018) 299-1111 • Fax: (018) 299-2799  
Internet: <http://www.nwu.ac.za>



In accordance with section 23(1) of the Higher Education Act, 1997 (Act No. 101 of 1997), as amended, the Potchefstroom University for Christian Higher Education and the University of North-West merged to form the North-West University on 1 January 2004. In accordance with section 24(1) of the Higher Education Act, 1997 (Act No. 101 of 1997), as amended, the staff and students of the Sebokeng Campus of the Vista University were incorporated into the North-West University on 2 January 2004.

## **ADDENDUM S**

North-West University  
Potchefstroom Campus  
Private Bag X6001  
Potchefstroom  
2520  
Tel: 018 299 1908  
2006-01-18

Dear Miss LO de Sousa

**Research study permission**

As the acting director, I do hereby grant you permission to do your research with the DVDs and portable DVD players in the Social Science module (LASW111).

I would also like to wish you all of the best with your studies. I am sure that the use of multimedia in the teaching of Social Sciences will ensure meaningful learning for students.

Yours faithfully

  
Dr. A. Gofightly

Acting Director: School for Human-Orientated School Subjects



**POTCHEFSTROOM CAMPUS**  
Private Bag X6001, Potchefstroom, South Africa, 2520  
Tel: (018) 299-1111 • Fax: (018) 299-2799  
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