

Learning and the use of smart phone devices – An experimental case study in a Gauteng Secondary School

By

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Thesis presented in fulfilment of the requirements for the degree of Master of Philosophy (Information and Knowledge Management) in the Faculty of Arts and Social Sciences at Stellenbosch University

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April 2014

DECLARATION

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DEDICATION

This thesis is proudly dedicated to;
My beloved father (late) and mother, for endless love, prayers, guidance, care, and everything
they have done since I was born;
My dearest wife and children, for the love, prayers, support and courage they have given me
since the establishment of a family;
My siblings for their cherished love and inseparability from childhood to date

SUMMARY

The purpose of this project was to investigate the prospects to advance and fast-track formal learning with the aid of smart phone technology, as learning should be reinforced through varied, pliable assets for engagement. The project's introduction clarifies more on this.

Chapter two focuses on literature review. Previous studies which are related to the topic were consulted to acquaint the researcher with thoughts and sentiments relating to the use of smart mobile devices in advancing learning.

Chapter three covers comprehension centred learning. It pays special attention to the theories of Barret and Bloom which are used as the framework for the experiment reported on in the next chapters.

Chapter four provides methodological background to the experiment. It describes the case study, curriculum correlation with smart phone functions, the organisation and analysis of the data, ethical issues in qualitative interviewing, and limitations of the empirical study.

Chapter five focuses on the experiment that was carried out to investigate the usefulness of smartphones to support and enhance formal comprehension strategies. Sub-types from Barrett's five learning types and Bloom's cognitive dimensions of learning provide the interpretive framework.

Chapter six discusses the findings of the experiment based on written and oral responses by participants after conclusion of the experiment, as well as teacher observations.

Finally, Chapter seven presents the conclusion and implications.

OPSOMMING

Die doel van hierdie projek was om die moontlikhede te ondersoek om formele leer aan te help en te bespoedig deur gebruikmaking van “smart phones.” Die aanname was dat dit ‘n groter verskeidenheid en buisaamheid van leerervarings behels. Die inleidende hoofstuk brei hierop uit.

Hoofstuk 2 dek relevant literatuur oor studies met betrekking tot die gebruik van “smart” mobiele apparate

Hoofstuk 3 handel oor begripgesentreerde leer. Dit gee besondere aandag aan die teorieë van Barret en Bloom wat die raamwerk daarstel vir die eksperiment wat in die volgende hoofstukke beskryf word.

Hoofstuk 4 bied die metodologiese agtergrond vir die eksperiment. Dit beskryf die gevallestudie, kurrikulum korrelasie met “smart phone” funksies, die organisasie en analise van die data, etiese aspekte van onderhoudvoering, en die beperkinge van die empiriese studie.

Hoofstuk 5 fokus op die eksperiment wat uitgevoer is om die bruikbaarheid van “smartphones” te ondersoek met betrekking tot steun en bevordering van formele begripgesentreerde leer. Sub-tipes van Barret se vyf leertipes, en Bloom se kognitiewe dimensies van leer bied die interpretatiewe raamwerk.

Hoofstuk 6 bespreek die resultate van die eksperiment na aanleiding van geskrewe en mondelinge terugvoer deur die deelnemers na afloop van die eksperiment, asook observasie deur die onderwyser.

Hoofstuk 7 bespreek enkele implikasies en gevolgtrekkings van die studie.

ACKNOWLEDGEMENTS

MIKM lecturers who, during the course work, laid the foundation for my Knowledge Management exposure and enhanced the little knowledge I had;

The Grade 12 learners who participated in this research for their friendly support, patience and assistance;

The school Principal who, throughout the project, has been enquiring about progress and giving words of encouragement;

The Gauteng Department of Education (GDE) for giving me permission to conduct this research in a school that falls under its jurisdiction;

And to

God Almighty who, through the blood of Jesus Christ, removed all the obstacles to make this research project possible.

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List of Abbreviations

- AMR- Adaptive Multi-Rate
- CAPS - Curriculum and Assessment Policy Statement
- CDs - Compact Disks
- CMLL - Computer Mediated Language Learning
- DBE –Department of Basic Education
- DVDs - Digital Versatile/Video Discs
- FET - Further Education and Training
- GDE - Gauteng Department of Education
- GPS - Global Positioning System
- HCI - Human Computer Interface
- HL - Home Language
- HOTS - Higher Order Thinking Skills
- ICT - Information and Communication Technologies
- ITU - International Telecommunication Union
- LOTS- Lower Order Thinking Skills
- KM – Knowledge Management
- MALL - Mobile-Assisted Language Learning
- MBE - Multimedia-Based Education
- MMS - Multimedia Messaging Service
- MP3 - MPEG-1 Audio Layer 3
- MP4 - MPEG-4 visual/audio codecs
- NDP - National Development Plan
- PDF – Portable Document Format
- SAIDE - South African Institute for Distance Education
- SALL - Self Access Language Learning
- SMT – Smart Mobile Technology
- SP – Smart Phone
- SPs – Smart Phones

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Chapter 1

Introduction

For the first time in history, many learners are more skilled than their teachers in using an assortment of computer driven devices to acquire and diffuse knowledge¹. These learners are often creative and fearless users and can incorporate new software and hardware as if it were second nature². Learners are some years ahead of their parents and teachers with respect to the prospective uses of information and communication devices. Much to the dismay of their teachers and parents, some of these ‘third generation’ learners rapidly become bored and frustrated if they are taught using traditional methods without ICT.

In this respect that mobile computer which is commonly known as a “smartphone” has become virtually ubiquitous and most certainly the device of choice for young people all over – even in under developed communities, such as in many townships in South Africa.

Can education practices capitalise on this?

1.1 The objective of this thesis

The objective of the research project that is described in this thesis was to explore the possibilities to improve and accelerate formal learning with the help of smart mobile phones.

South Africa’s education system focused, for some time, on a move towards a learner-centred, flexible approach using a grouping of learning and teaching strategies. The integration of smart mobile devices into secondary school education curricula is one such strategy that needs to be taken into consideration. Learning ought to be supported through diverse, flexible resources for engagement. This can be attained by opting for audio-visual aids that deliver various and flexible approaches for content presentation and learning support. Given the fact that smart phones are by now almost ubiquitous, it is almost self-evident that they would be the mobile device of choice for the research.

¹ Kirschner, P. & Selinger, M. 12 (1), 5-17.

² Jonassen, D. H. 2000

Smart mobile devices are defined as a growing range of portable or handheld electronic devices that can perform a variety of functions that we think an intelligent person can perform. Such mobile devices at present include smart phones, laptop computers, tablet computers such as iPads and GPS devices.

The focus in this research project is on one such device – the *smart phone*. Smart phones (henceforth SPs) are by far the most-used mobile device, and have become progressively more user-friendly, inexpensive, and ubiquitous. They appeal to young people. They include a host of multimedia options for storing and listening to music, watching movies and television shows, and taking and sharing photos, audio and video.

1.2 The design of the research

In essence the research reported on in this thesis is experimental.

1.2.1. The research was based on the following axioms:

- 1.2.1.1. The use of SPs in teaching and learning will be accepted by learners as a learning tool without resistance
- 1.2.1.2. The application of the multimedia features of SPs will broaden the cognitive brain functions involved in language learning - particularly in underdeveloped communities
- 1.2.1.3. The use of SPs' multimedia functions allows for a higher level of learning than the usual one-dimensional teaching process

To investigate the axioms, an experiment was conducted during the first semester of 2013 with a Grade 12 class in a township school in Gauteng. The experiment consisted of a teaching curriculum into which continuous use of the multimedia functions of SPs was integrated.

1.2.2. The design of the experiment had the following aims:

- 1.2.2.1. To test the feasibility of using SPs as integral tools in the delivery of a given curriculum
- 1.2.2.2. To test learners' adoption of such learning process, particularly as the setting of the experiment was a township school in a predominantly developmental context
- 1.2.2.3. To determine if an increase in subject interest and cognitive skills occurred as a result of the use of SP-mediated teaching

To answer the above questions, a range of theoretical resources had to be engaged. The core theoretical framework was found in the cognitive theories of Bloom and Barrett (both being foundational in education theory and curriculum development in South Africa). Their work is discussed in chapters three and four, and form the theoretical framework for the experiment reported on in chapter five.

Ultimately, however, the research was designed not as an extension or application of a dominant theory, but as an experiment which combined practical considerations with recognised learning theory.

While this is not the first attempt to evaluate the use of mobile devices in learning, it is the first made in South Africa within the context of institutional learning, in particular in a developing context.

The required local authorisation from the school, parents and learners as well as from the Gauteng Education Department was obtained with a remarkable degree of goodwill. From the start it was clear that there was an anticipation that the experiment might lead to enhanced learning in future.

1.3 What inspired the research?

Fundamental to this project is the improvement of comprehension learning by incorporating SP technology into instructional design. One theory associated with this process is the cognitive theory of multimedia learning based on the notion that human beings have two ways of processing information: either audio or visual³.

Another essential input to theory about learning with technology which is related to the cognitive theory of multimedia learning is the modality principle. This principle hypothesises that using multiple modalities when presenting information leads to more learning transfer. The theoretical foundation for bringing multimedia presentations involving audio and video into the classroom is based on the aforementioned theory and principle.

Smart mobile technology makes learner-centred learning possible by allowing learners to control the transfer of and access to information in order to augment their skills and knowledge and to meet their own educational goals⁴. Learning with the help of smart mobile

³ Mayer, R. E. (1997)

⁴ Sharples et al., 2007, p. 223

technology makes education more accessible in that it permits learners to pursue their studies according to their own schedules.

Three studies on mobile learning are presented by Thornton and Houser⁵. These questioned university students regarding their use of mobile devices. Students also had English vocabulary lessons emailed to their mobile phones, and a website explaining English idioms was created which students could access using mobile phones.

Another study by Kiernan and Aizawa⁶ reports on a classroom research project aimed at evaluating the use of mobile phones as tools for classroom learning. Task-based learning in pairs and small groups was identified as a promising place to develop mobile phones as learning tools. A broad overview of the field of computer-mediated second language learning, which makes significant reference to the use of cell phone technology, is also provided by Thorne and Payne's *Evolutionary Trajectories, Internet-mediated Expression, and Language Education*⁷.

A solid theoretical framework for SP-learning is required because research has been done on how mobile devices can support and improve collaborative learning in a range of contexts⁸, but there is less literature on whether and how such devices are used for collaborative learning in the pursuit of learners' own learning goals. Mobile technology tends to be integrated into the instructive context within techno centric approaches without an incorporated and solid theoretical framework for mobile-learning (m-learning). It is common, in the absence of such a theoretical framework, to call upon current learning theories based on traditional educational processes, distance learning or electronic learning (e-learning).

M-learning, as an enabler of new learning, goes further than emphasising the possession of information to supporting learners in discovering, recognising, manipulating and weighing prevailing information⁹.

Another major area of research and practice is Computer Mediated Language Learning (CMLL). Warschauer¹⁰ notes that increased attention is being given to mobile CMLL.

⁵ Thornton, P., & Houser, S. 2005. 21, 217-228.

⁶ Kiernan, P. J., & Aizawa, K. (2004) 16(1), 71-84.

⁷ Thorne, S. L. & Payne J. S. 2005. Journal, 22, 371-397

⁸ Hennessy 2000; Hoppe et al. 2003; De Crom & De Jager 2005; Roschelle 2003; Walker 2006.

⁹ Brown, T. 2003, June.

¹⁰ Warschauer, M. 2007. pp. 907-912

SPs have gradually become sophisticated in terms of their features, which now include cameras, audio and video recorders, MP3 players, electronic bilingual dictionaries, speech recognition software and text-to-speech conversion. These have been identified by Chinnery¹¹ as common cell phone features that facilitate communicative language practice.

Learning through the use of SPs can play a vital role in those situations where expense presents a substantial barrier to learning. To many secondary school learners, mobile technology is much less cost-prohibitive than other technologies like personal computers and broadband connections that are necessary for e-learning. Learning with the aid of SPs presents great opportunities for learners in remote or rural areas where infrastructure and environmental challenges impede other learning modalities such as e-learning.

Through mobile technology¹², learners participate in conversations whereby they understand the experiences of others, resolve differences, and create mutual interpretations and shared understandings of the world.

A seminal overview of Mobile Assisted Language Learning (MALL) was presented by Kukulska-Hulme & Shield¹³. This study enquires whether and how mobile devices support collaborative practice in speaking and listening. Two main approaches to MALL are presented, namely; content-related and design-related studies. Although the focus is now moving towards design-related studies when creating genuine social mobile learning environments, both approaches are still prevalent in the literature¹⁴.

Self-Access Language Learning (SALL) is another approach¹⁵ to learning. The focus of this approach is on the advancement of learner independence by moving learners away from reliance on the teacher and encouraging them to manage their own learning. SPs can support learners in managing their learning by providing them with mobile, self-directed access to materials and resources.

Rather than wasting time and money concentrating on projects that will not reduce the inequality between rural and urban areas, let us focus on educational services that can be delivered with learners' existing resources. Apart from SPs presenting a less cost-prohibitive medium for learning, they also represent a significant possibility by which to decrease the gap

¹¹ Chinnery, G.M., 2006, 10 (1)

¹² Nyiri, 2002; Sharples et al., 2007, p. 225-26

¹³ Kukulska-Hulme, A., Shield, L. 2008, 20(3), 271-289

¹⁴ Wong L.H. & Looi C.K., 2011, 2364–2381.

¹⁵ Gardner D. & Miller L. 1999

between the haves and the have-nots in modern society where access to information and knowledge is indispensable.

Comprehension language packages currently used in our secondary education system are textbook-subjugated. This theoretical thinking is too demanding for learners. What we need these days are packages that are thriving, robust, appropriate and eloquent.

SPs' multimedia features and other capacities are tools that can clarify abstract concepts and benefit learners by encouraging them to participate actively in their learning. Through these features, the real world is brought into the classroom and learners are able to illustrate their arguments with audio and video clips, photos, diagrams, and other visual resources. For example, rural learners can bring urban areas into the class, and vice versa. Prensky and Benta et al.¹⁶ have identified, amongst others, features like voice recording, graphics and cameras to be particularly important in supporting learning and knowledge transfer.

The learning process can be improved by incorporating multimedia as it affords learners more control over the transfer of information and it supports interactivity. Cairncross & Mannon¹⁷ stress that, "multimedia can support multiple representations of the same piece of information in a variety of formats". Multiple representations provide learners with a realistic learning environment that gives them access to multiple roles and perspectives. Tools like voice and video recorders, cameras, PDF and PPT viewers, and others that support knowledge acquisition, codification and absorption should make it possible to transfer tacit knowledge in a mobile environment¹⁸. SP multimedia features can play a vital role with regards to this.

Language learners may, for example, use their SPs' video feature for watching history, which allows a learner to use the recorded video more than once without spending a lot of his time having to go for an expedition. They can also learn by listening to the radio or recorded audio conversation¹⁹. These features expose them to genuine conversational language rather than the written language presented in textbooks.

Stempleski and Tomalin support the idea that activities recommended for developing listening and speaking skills focus on visual content, where learners must present what they have seen in a sequence²⁰. This is also supported by Allan²¹, who believes videos showing people with

¹⁶ Prensky, M. 2004:1–6 and Benta, K.L. *et al.* 2004:27

¹⁷ Cairncross, S. and Mannon, M. 2001. 38(2), 156-164(9)

¹⁸ Weininger M. and Shield S. 2003

¹⁹ Eaton, S. E 2010

²⁰ Stempleski, S. and Tomalin B. 1990

objects in a real setting provide information about the social, cultural or professional life of a country.

All these ideas can be implemented through the use of learners' SP anywhere (in urban or remote areas) and anytime (during and after contact time).

1.4 Methodology

1.4.1 Learning types and the cognitive dimensions of learning

The project activities are reliant on sub-types from Barrett's five learning types. Bloom's cognitive dimensions of learning are also taken into consideration. A brief description of the two is given here, while in chapter three a more extensive discussion is presented.

Thomas Barrett's taxonomy²² comprises five learning types: literal comprehension, re-organisation, inferential comprehension, evaluation, and appreciation. This taxonomy can assist learners in developing comprehension skills, and teachers in synthesising and developing comprehension questions and/or test questions for reading²³. This taxonomy is also useful for classroom assessment in other content areas as well.

Benjamin Bloom's²⁴ cognitive dimensions of learning is divided into two types of thinking skills: Higher Order Thinking Skills (HOTS) which consist of analysing, creating and evaluating, and Lower Order Thinking Skills (LOTS) which include remembering, understanding and applying. However, in Bloom's hierarchical taxonomy, no higher-level learning can occur without lower-level learning being mastered.²⁵ Bloom's learning taxonomy highlights the different components of the human learning process and its different levels of complexity.

Barrett and Bloom's taxonomies are point of reference both in the design of the experiment and in evaluating its outcome.

1.4.2 Method of assessing the impact of smart mobile interventions on learning

The researcher followed a qualitative approach in assessing the impact of smart mobile interventions on learning. Data was obtained through the use of the following methods: semi-

²¹ Allan, M. 1985

²² Barrett's taxonomy of Comprehension: 1968, 17–23.

²³ Clymer T. 1968, 7–29

²⁴ Bloom and his colleagues wrote, that some teachers believe learners should really understand, others desire their learners to internalize knowledge, and still others want their learners to grasp the core or essence or comprehend. That shows that teachers are meaning different cognitive dimensions (1956, p. 1).

²⁵ Bloom once said; "It is obvious at least to me, that many of the criticisms directed toward the taxonomy have resulted from very narrow interpretations of both the taxonomy and its proper application" (1994, p. 7).

structured interviews, a survey and observation. Using these instruments, the study investigated how learners can integrate SP features into the cognitive dimensions of learning to enhance learning. Qualitative details about how learners used their SPs to support their formal learning facilitated the widening of our understanding of the potential of SPs as aids to learning.

1.4.3 Learning sub-types and activities done by learners

As explained above, project activities are dependent on sub-types from Barrett's five learning types. Bloom's cognitive dimensions of learning are also taken into consideration.

In the first term of the school year learners did the following activities: recognition or recall of details through comprehension tests, recognition or recall of a sequence using an essay mind-mapping technique, recognition or recall of cause and effect relationships through drama analysis, classifying and synthesising through orals, outlining and synthesising through grammar, summarising through a summary passage, synthesising through drama analysis, inferring main ideas through essay writing, judgments of reality or fantasy through poetry, judgment of appropriateness through poetry, judgments of worth, desirability and acceptability through drama analysis, emotional response to content through orals and reactions to the author's use of language through poetry.

In the second term learners did the following: inferring supporting details through listening comprehension, inferring comparisons through essays, predicting outcomes through a prescribed novel, judgments of fact or opinion through listening for critical analysis and evaluation (listening oral), judgments of worth, desirability and acceptability through summary and imagery through poetry.

1.4.4 Time schedule for the activities

The thirteen-week-long project was conducted during the first and second school terms of 2013. This took place after school during extra lessons. Grade 12 learners at the school where the project was conducted have been allocated time to study every day between 14h40 and 16h00. The researcher used Tuesdays and Thursdays as these are the days reserved for Home Language study.

1.4.5 Ethical assurance

There was no intrusion in the personal affairs of learners. At no stage did learners use internet-based systems. All features integrated were available offline. No costs were incurred

throughout the project. All activities took place within the framework of the prescribed curriculum.

1.5 Layout of the thesis

An overview of the next chapters of this research project is provided as follows:

Chapter two presents a literature review of previous studies which are related to the topic. The intention behind this was to familiarise the researcher with the reflections and views relating to the use of mobile devices to enhance learning. The knowledge reinforced the researcher's vision and made it possible for him to decide on important topics to be covered in order to trim down the research. The chapter is divided into three sections: the educational nature, human computer interface (HCI) theory, and learning theory.

Chapter three provides a full understanding of comprehension. It focuses on reading comprehension, listening comprehension, correlations between reading comprehension and spoken language comprehension, text types, teaching comprehension, and using comprehension taxonomies (primarily based on Barrett's taxonomy with general support from Bloom's taxonomy). The emphasis placed on these taxonomies is due to the fact that this project focuses more on them to address the research problem.

Chapter four deals with the research methodology and highlights the process followed in undertaking research in order to solve the problem. The following are aspects to be expounded: the purpose of the literature review, the purpose of the case study, the research design (which comprises the participants of the study and sampling, qualitative research design and data collection technique), qualitative data analysis, reliability and validity, ethical considerations, the limitations of the study and the conclusion.

Chapter five focuses on experiments that were carried out in order to prove that SPs are excellent mobile devices to support and enhance taxonomies that can assist in synthesising and developing comprehension strategies. Such project activities are reliant on sub-types from Barrett's five learning types. Bloom's cognitive dimensions of learning are also taken into account.

Chapter six delivers the results of the project. Findings emanated from a number of interviews that were conducted after the experiment with participants. Such interviews were conducted individually and in groups. Findings were also derived from observations made by the

researcher of participants' SPs' enhancement of the two taxonomies. Finally, chapter seven presents the conclusion, implications and recommendations.

Chapter 2

Literature Review - *ICT in Teaching and Learning*

As was stated at the beginning of chapter one, for the first time in history, many learners are more skilled than their teachers in using an assortment of technologies to acquire and diffuse knowledge. This has had an impact on how education departments and education theorists think about the use of computer driven support in the teaching and learning praxis.

This chapter presents a selective overview of literature on the practical side of ICT adoption for teaching and learning purposes.

2.1 Educational nature

Institutions of learning are increasingly adopting ICT (e.g. mobile devices) to provide solutions to the challenges facing them. Indeed, the integration of the mobile context and technologies into the learning environment has been encouraged over the years²⁶.

The South African Institute for Distance Education (SAIDE) undertook an extensive research project in 2002 and 2003 to investigate the use of computers in teaching and learning in South African schools²⁷. The project showed that one of the reasons that ICT projects in schools do not succeed is that principals and teachers are often not properly informed about what ICTs can or cannot do. Learning with the assistance of SPs will resolve problems of this nature because both learners and teachers are acquainted with the tool.

According to Bloom²⁸, the teacher must understand the level of maturity at which the child operates and employ instructional procedures that make more extensive use of concrete material and socially significant experiences. SPs can bring such materials and experiences to the class in a more lively and adaptable way than unalterable text books.

²⁶ Benta, K.L., Cremene, M. & Padurean, R. 2005:27; Sharples, M., Taylor, J. & Vavoula, G. 2005:1

²⁷ SAIDE, 2003

²⁸ Bloom B.S., 1968

Barrett's taxonomy²⁹ is very applicable for teaching literary texts as it takes into consideration not just the cognitive dimension but also, according to Tollesfeson³⁰, the affective dimension that is an indispensable aspect of the study of literary texts.

Literal comprehension focuses on ideas and information which are explicitly stated in the given text. At this level, reading aims and teachers' questions designed to elicit responses regarding the text may range from simple to complex. A simple task in literal comprehension may involve the recognition or recall of a single fact or incident³¹.

According to the Department of Basic Education's (DBE) Curriculum and Assessment Policy Statement (CAPS) for home and first additional languages, teachers may integrate the technology for studying film and audio-visual media³² - despite the fact that such activities may not be available at all schools. By integrating SPs, the unavailability of technology at certain schools will not be felt at all.

The DBE has, according to its language policy document, allocated time for audio clip (listening for comprehension: two-minute-long clips for Grades 10 and 11, and three-minute-long clips for Grade 12) and audio-visual programmes (TV programmes and documentaries, slide shows, recordings, radio programmes, photographs and music videos) OR a 30-minute test (inclusive of two-minute audio clips [Grades 10 & 11], and three-minute audio clips [Grade 12])³³.

SPs can, if bidden, do almost all of the DBE's above-mentioned audio and audio-visual tasks. Without them, the aspired implementation will be very slow, or may not take place at all due to the lack of other technologies.

2.2 Human computer interface theory

SPs are getting smaller and more powerful every day. Some of them are a mere two by three inches, with the thickness of three credit cards, and are made entirely of paper. Kirsti³⁴ examined how learners today find it easy to pick up any new electronic device and learn how to communicate with it. This supports the proposal made in this study in that no formal

²⁹ Clymer T., 1968

³⁰ Tollesfeson, J. W., 1989

³¹ Clymer, T., 1968

³² DBE Curriculum and Assessment Policy Statement (CAPS); home and first additional languages, 2011

³³ DBE Curriculum and Assessment Policy Statement (CAPS); home and first additional languages, 2011

³⁴ Kirsti A. 2005

training for the use of the tool (such as that necessitated by projects like Gauteng Online) will take place as learners and educators are acquainted with SPs.

The International Telecommunication Union (ITU) expected cell phone subscriptions to surpass five billion in 2010³⁵. This expectation was fulfilled, and SP subscriptions will reach similar numbers in 2014 – giving the DBE the opportunity to carry out the aspired execution of audio and audio-visual tasks in secondary schools.

SPs are so advanced that they actually perform almost the same functions and possess the same features as personal computers³⁶, and like all communication and computing devices, cell phones (with camera, audio and video) can be used to learn³⁷. The portability of mobile technologies is another factor which motivates both language learners and language teachers to use them³⁸.

SPs' role and value in education may be just as important as that of the human brain. Losing one's SP is as serious as a learner losing his/her school bag. Today most learners have SPs and more and younger kids are getting them as well. Although most schools prohibit their use, some are beginning to see their potential. SPs encourage us to harness the power of an average phone in education because they have more computing power than many of the computers of a decade ago.

Education.au limited³⁹ reports that SPs are being used to record text, audio and video information for storage, immediate transmission and/or transfer to a Personal Computer (PC), making them viable for use in certain types of projects.

Educational tasks and information, learning sequences, and other resources related to the learners' needs could be downloaded to the SP. Bluetooth, Multimedia Messaging Service (MMS) and Short Message Service (SMS) allow the sending of a range of file types between mobile phones. SPs enable transmission of video clips, sound files, text messages and they support email. Today mobile phones are MMS-ready and ubiquitous, and ready for use in an educational context⁴⁰. Such services will enable the smooth transmission and transfer of photos, text and PDF files, audio and audio-visual tasks.

³⁵ Whitney L., 2010

³⁶ Cui G. and Wang S., 2008

³⁷ Prensky M., 2004

³⁸ Norbrook H. & Scott P., 2003

³⁹ Millea J. et al.; 2005

⁴⁰ Millea J. et al., 2005

Cell phones and SPs have also been used to teach English at a Japanese university⁴¹. In some projects, English vocabulary lessons were e-mailed at timed intervals to learners. It was reported that learners who received these lessons on their mobile phones learned more than learners who received identical materials on paper or the Internet.

As mobile technologies are often an essential part of a learner's daily life and learners are often quite comfortable manipulating their devices' tools, capabilities and settings, integrating the technologies into the learning process makes the means of learning understandable⁴².

In this study SP features such as cameras, video and audio recording will be used as important tools for capturing knowledge. In 2003, The Ninth Americas Conference on Information Systems⁴³ proposed that mobile computing technology can become an important part of the knowledge management process, not only because of its ability to access information anytime and anywhere, but also because of its ability to facilitate the capture of information for later use.

Weininger and Shield⁴⁴ maintain that the convenience of tools like voice and video recording, SMS, MMS, and others that support knowledge acquisition, codification and absorption should make it possible to transfer tacit knowledge in a mobile environment.

Surveys conducted in 2007 summarized data from more than fifty eight thousand teenagers across 31 countries. These data showed that youth use their mobile phones to send text messages, play games, listen to music, and take pictures⁴⁵. However, the mobile phone to many, is not a device for making phone calls, but rather a 'lifeline' connecting them to the social network and an instrument for coordinating their everyday life⁴⁶.

The work of Nyíri⁴⁷ and Bachmair⁴⁸ stands out in its effort to confirm how communication, everyday use of media and learning could provide the basis for how mobile devices can impact positively on learning.

⁴¹ Thornton, P., & Houser, C. In B. Morrison, C. Green, & G. Motteram (Eds.), *Directions in CALL: Experience, experiments & evaluation* (pp. 207–224). 2003

⁴² Wang Y., 2004

⁴³ The Ninth Americas Conference on Information Systems 2003

⁴⁴ Weininger M. and Shield S., 2003

⁴⁵ Sulake 2008

⁴⁶ Matthews, 2004

⁴⁷ Nyíri K., 2002

⁴⁸ Bachmair B., 2007

To some, the term “mobile learning” highlights learning on the move; for others, it is the personal, ever-present, and immediate nature of the devices involved⁴⁹. Both opinions put emphasis on mobile learning as a process characterised by the gaining of knowledge through exploration and conversation across a variety of environments.

Some have characterised mobile learning as learning that takes place anywhere and with anyone⁵⁰. All of these views, and others, point to the changing possibilities for learner engagement. Vavoula⁵¹ suggested that mobile learning has the potential to change learning from being highly intentional, structured, and directed, to an experience that values informal and open learner-centred activity more.

MALL is to a great extent important for the development of the pedagogical sector. With MALL learners are able to access language-learning materials and converse with their teachers and peers at anytime, anywhere.

Learner-centred learning is central to ideas of future learning⁵². Past studies reveal that the integration of mobile context and technologies into group learning can contribute to reducing some of traditional learning barriers⁵³. In a study that investigated the impact of mobile technology on knowledge transfer in student groups, Shongwe⁵⁴ found that mobile technology can minimize social barriers and time constraints and motivate learners. Rural learners may, through their SPs, have the experience of urban life.

Kukulka-Hulme⁵⁵ believes that technology is a social and cultural phenomenon which influences the ways in which people learn⁵⁶. Within language-learning contexts, one of the main discussions about technology involves the incorporation⁵⁷ of the technology into the language curriculum. The technology will be normalised when it is as indiscernible and natural as whiteboards and pens. It is only with this normalisation that technology will “have found its proper place in language education”⁵⁸.

⁴⁹ Kukulka-Hulme A. and Traxler J., 2005

⁵⁰ Stoyanov S. et al., 2010

⁵¹ Vavoula G., 2004

⁵² Tokoro M. and Steels L. 2003

⁵³ Levin L.M., 2002 and McKenzie J.S., 2001

⁵⁴ Shongwe M.M., 2009

⁵⁵ Kukulka-Hulme A. 2009, p. 158

⁵⁶ Beetham H. & Sharpe M., 2007, p. 6

⁵⁷, Chambers A. & Bax M.J.W., 2006 p. 466

⁵⁸ Chambers A. & Bax M.J.W.

Bluetooth-enabled phones are used positively to transfer data, including word, image, sound and video files both to and from mobile phones once a network connection has been established⁵⁹. Curiously, most learners enjoy incorporating text, graphics, animation, sound, voice, music, still pictures and motion video into their designs, and are mostly immersed with the video, audio, and animation components of multimedia⁶⁰.

As shown by anecdotal evidence from several of the respondents⁶¹, students have been prevented from using mobile devices to record lectures despite the fact that this was a legitimate attempt by them to improve their chances of understanding the lecture. This study will not focus on learners recording teachers, but learners may take pictures of notes written on the board or use the camera as a hand-held scanner to copy a passage in a book which the learner does not possess. Learning through SPs does not have the potential to emerge as a different pedagogy which challenges and disrupts established conceptions of teaching.

Semrau & Boyer⁶² note that “the use of video discs in classroom instruction is increasing every year and promises to revolutionize what will happen in the classroom of tomorrow”. Although Clark & Estes⁶³ attribute the ineffectiveness of past research programs on media “to a history of mindless and demonstrably wrong advocacy of popular electronic media to foster motivation and learning”, SPs are indeed tools that are fostering motivation and learning and do not need an extra device to record and play such as that required by video disks.

2.3 Learning theory

Learning theories are theoretical frameworks describing how information is captured, handled, and retained during learning. Cognitive, emotional, and environmental influences, as well as prior experience, all play a part in how understanding, or a world view, is acquired or changed, and knowledge and skills retained.

This research project is positioned within one of the well-known streams – *cognitivism*. Cognitivism is the theory that individuals generate knowledge and meaning through sequential development of an individual’s cognitive abilities, such as the mental processes of recognition, recollection, analysis, reflection, application, creation, understanding, and

⁵⁹ Drummond S. 2007, Final_report_2007.pdf. Retrieved: Feb, 12

⁶⁰ Yang S.C. and Chen Y. 2006

⁶¹ Bird, P., & Stubbs, M. 2008

⁶² Semrau, P. & Boyer, B. A., 1994, p.2

⁶³ Clark, R. E. & Estes, F. 1999 39(2), 5–16

evaluation. Bloom and Barrett's taxonomies feature well in this theory.

In this study, Cognitivism is strengthened by multimedia learning theory, which focuses on the principles that determine the effective use of multimedia in learning, with emphasis on using both the visual and auditory channels for information processing. Multimedia learning seeks to give teachers the ability to inspire both the visual and auditory channels of the learner, resulting in better progress

The purpose in education is to develop conceptual knowledge, techniques, procedures, and algorithmic problem solving.

A communicative approach suggests that when learning a language, a learner should have a great deal of exposure to the target language and many opportunities to practise or produce the language by communicating for social or practical purposes.

According to the DBE, when language-learning skills are in the process of being integrated into the curriculum, "focus on one skill may lead to practice in another, e.g. a learner involved in a debate will have to read some discursive essays and then produce his own written discursive essay using language structures such as synonyms and antonyms, negations, conjunctions, etc."⁶⁴.

Participatory learning includes the many ways that learners use new technologies to participate in virtual communities where they share ideas, comment on one another's projects, and plan, design, implement, advance, or simply discuss their practices, goals, and ideas⁶⁵.

Group learning, according to most writers, plays a vital role in enhancing student understanding, sharing of knowledge and critical thinking. Collaborative learning is described as a small group of individuals working together to realize an objective. The use of SPs in learning will promote the adoption of group learning as an addition to traditional methods. Group learning through SPs will pave the way for learners to share knowledge, ideas and skills to achieve specific goals.

A number of articles purely focus on the intersections between language education and the use of new technology⁶⁶. The focus of this study is not on the SP technology in and of itself,

⁶⁴ Department of Basic Education, 2011

⁶⁵ Davidson C.N. and Goldberg D.T. 2009

⁶⁶ Davidson C.N. and Goldberg D.T 2010

but rather on how the SP technology is used to boost and change language learning and language teaching.

Grittner⁶⁷ suggests that for effective language learning to take place, visual and audio learning materials must be totally integrated into the teaching/learning process. Birkmaier⁶⁸ also highlights that studies reveal machine-aided instruction to be effective in intensive language learning.

It therefore becomes increasingly important for users of the new electronic media in general and for language learners in particular to be empowered and trained in the infinite, simultaneous use of two or more modes for making meaning. Murphy⁶⁹ mentions that autonomy, independence and responsibility are among the greatest assets of using mobile technologies in language learning.

SPs as mobile devices have “an affinity with movement between indoors and outdoors, across formal and informal settings, allowing learners to lead at least some of the way”⁷⁰, and they are usually owned by the learners themselves, at a relatively low cost⁷¹. These characteristics mean that SPs have the potential to become important devices not only in language learning in general but particularly in SALL. SALL is an approach to learning where the focus is on the promotion of learner autonomy by moving learners away from dependence on the teacher and towards independence in managing their own learning⁷². SPs can assist learners in managing their learning by giving them mobile and autonomous access to learning materials and resources.

Jonassen et al.⁷³ argued that meaningful learning happens when learners are active, constructive, intentional, cooperative, and working on authentic tasks. Learning and the use of SPs involves meaningful learning as a cooperative mission in which learners are active, productive and intentional.

The capacity of an SP to access, manipulate, produce, store or share content almost as soon as it is created wherever it is created provides the rationale for why education needs to explore

⁶⁷ Grittner F.M. (1969)

⁶⁸ Birkmaier, E. M. (1973).

⁶⁹ Murphy L., 2008

⁷⁰ Kukulska-Hulme A, 2009, p. 164

⁷¹ Johnson, L., et al. (2011). The 2011 Horizon Report. Austin, Texas: The New Media Consortium. et al, 2011

⁷² Gardner D. & Miller L. 1999

⁷³ Jonassen D.H. et.al , 2003

the technology. This versatility promises to change the nature of educational content and communication and therefore the nature of learning itself⁷⁴.

Teaching, as described by Brown⁷⁵, comprises approaches, syllabuses, techniques, and activities. He emphasises that we need to first create activities that are simply learned, easily used, and pedagogically fitting. We also need to combine them into techniques and syllabi, creating an approach for using mobile technology in language education. SPs can be used to collect video, image and audio data for creating digital narratives or stories for use as curriculum resources.

A single picture can tell a story, but stories can come from multiple pictures with or without the addition of words. Learners can use their SP camera to take a number of photos that are representative of the things they did on a particular day. Then they could use their photos to write about what happened in their lives on that one day.

Cell phones with cameras are tools for scientific data collection, documentation, and visual journalism, allowing students to gather evidence, collect and classify images, and follow learning progressions over time⁷⁶. Creative cell phone photos can inspire students' creative writing via caption or story contests.

All camera devices I'm aware of take photos and record video. These features can be used for many learning activities, such as recording procedures for later review, or recording a learner doing a task for later, or remote assessment.

For learners to have the prospect of sharing their lives and stories through not only words but also pictures is very pleasing. This is supported by Melton's statement that "if people aren't given opportunities to use the two brains (words and pictures), their potential remains untapped and much enjoyment in life is missed"⁷⁷.

Semantic mapping offers a variety of strategies to display information graphically within categories that are related to a central concept⁷⁸. A standard means of writing down the results of a brainstorming session in a well-structured way is mind-mapping⁷⁹.

⁷⁴ Woodcock B. et al. 2012

⁷⁵ Brown A. L., 1995

⁷⁶ Prensky 2004

⁷⁷ Melton, 1985, p. 24

⁷⁸ Heimlich & Pittelman, 1986

⁷⁹ Buzan, 2003

Four higher-order social uses of personal photography have been defined by Van House et al.⁸⁰. They are: creating and maintaining social relationships, constructing personal and group memory, self-presentation, and self-expression.

Multimedia SPs equipped with audio and video recording devices enable recording of learners' oral speech. Such devices are of particular interest to second language teachers who aspire to have learners practice their oral language skills in activities that may be done in the class or at home⁸¹. Teachers may use SPs to improve students' oral language skills by designing projects or assignments that require students to create an audio or audio-visual file.

The convenience of the video feature in SPs enhances the audio feature by allowing additional nonverbal language support (body language, facial expressions and gestures), a feature language learners regularly remark upon as extremely useful in developing their oral expertise⁸².

The treading of activity completion or material access is reliant on learners. As Payne and Whitney⁸³ note, "the notion that learners can practice speaking in an environment where affect and rate of speech are minimized is very appealing".

Video and multimedia technology can enhance a learning experience where learners need to write a paper or report that presents their understanding of a specific subject or topic. This (video and multimedia technology) also provides an opportunity for collaborative learning between learners and their peers, and enables dialogues between a learner and a teacher⁸⁴. By applying this technology, learners analytically reflect on and chat about one another's report development and video creation processes.

Through collaborative learning, learners learn how to critique and reflect on their thinking and gain multimedia literacy skills by making and editing video clips.

Jokela et al⁸⁵ have designed video editing tools to be used on a mobile phone. They have made a set of editing tools that allows users to create short video presentations by changing the order of the clips, cutting a video clip and inserting an audio track into the clip. Based on their study, video editing on mobile devices is realistic regardless of small screens and

⁸⁰ Van House et al. 2005

⁸¹ Huffman 2011

⁸² Robin, 2007

⁸³ Whitney 2002 p.25

⁸⁴ Liao 2007

⁸⁵ Jokela T. et.al. 2007

inadequate input devices.

As Greenwood⁸⁶ indicated, video is an enormously “powerful and sophisticated form of communication that has changed our culture and continues to have a profound effect on our society”. It is an enormously influential and well-mannered form of communication that has transformed our culture and continues to have a considerable effect on our society. Video usage in education act as a tutor, and it becomes knowledge and information resource. In this fashion, video is inactively used to support teaching and learning. At the same time, video could also become an active education process. Constructing video as an activity project is one way to involve learners in learning.

The management of video use in teaching needs to be supported at policy level by addressing the promotion of centralisation and dissemination of information about video resources.

People learn their native language as children by hearing the spoken language and then imitating it⁸⁷. It is the type of learning that is often disregarded. The most efficacious language-learning methods are primarily audio-based. At the same time the significance of reading cannot be ignored, but evidently the most important facet of communicating in a language is listening and speaking.

Audio has, in the past, been played through radio, TV, cassettes, Compact Disks (CDs) and Digital Versatile/Video Discs (DVDs). Audio may be more inspiring than print alone, and together with print may form an alternative to reading alone⁸⁸. Audio, through the above-mentioned techniques, has been known to help recall, support retention, and lead to concept formation and higher-order thinking (analysing, evaluating and creating). Chan and Lee⁸⁹ ascertain that audio has been ignored in recent times and that the rise in availability of mobile technologies and the extensive availability of broadband is easing this situation.

Audio comprehension tests are intended to evaluate a listener's understanding of a spoken passage and are consistently a key component of language competency exams. As reading comprehension exams are proving valuable in evaluating text-based language processing technology, audio comprehension exams can be used to evaluate spoken language processing systems⁹⁰.

⁸⁶ Greenwood 2003

⁸⁷ Kuhl, P.K., Meltzoff, A.N. 1996

⁸⁸ Newby T. et al., 2000

⁸⁹ Chan, A., and Lee, M. J. W. 2007

⁹⁰ Palmer D et.al 2000

Audio-only activity allows the learner to concentrate on the auditory channel and is a useful medium that can enhance their understanding. However, it requires a considerable feat of memory to sustain an understanding of the full meaning of a passage until it can be reflected upon and tied to other activities at a later stage⁹¹.

Many teachers implemented a new kind of writing which uses multimedia as a tool⁹². Multimedia writing involves communicating through not only text but also other communication forms such as sounds and images. Consequently, multimedia writing has turned out to be a significant tool in literacy development. The inclusion of technology makes possible the extension of literacy in the communication process⁹³. As technology provides improvements to writing, teachers should also explore how to advance new curricula or projects in classes that assist learners to expand their multimedia literacy.

ICTs are having a profound effect on all aspects of language use, especially in written communication⁹⁴. The purposes of writing, the genres of written communication, and the nature of audience and author are all changing rapidly with the diffusion of computer-mediated communication, both for first and second language writers.

Comprehension centres on those objectives, behaviours, or responses that epitomise an understanding of the literal messages contained in communication⁹⁵. Text comprehension takes place with a limited working memory.

Bertens⁹⁶ argues that the expected outcome of introducing the learners to a formalist reading approach is to enable them to connect the form of the literary text to its context or main issue. Using SP recording devices, learners can record themselves reading a passage of a comprehension, drama, novel or poem. When they start to listen to their recordings they are expected to move a few steps away from merely retelling the sequence of the text (LOTS), a common tendency among most learners, and be able instead to critically connect the little parts that make up the whole of the text to a main theme (HOTS).

⁹¹ Laurillard D., 2002

⁹² Daiute and Morse, 1994; DeVoss, Cushman, and Grabill, 2005; Fan, 1996.

⁹³ Daley, E. 2003, 38(2), 32-40

⁹⁴ Warschauer M., 2007

⁹⁵ Bloom B.S., 1956, p. 89

⁹⁶ Bertens H. 2002:31-52

Chapter 3

Literature Analysis - *Learning and Comprehension Theory*

3.1 Introduction

Individuals who take an interest in education understand very well that distress about poor learner attainment in literacy has reached levels that border on desperation. There is a mounting concern about South African learners' insufficient literacy skills. Secondary school learners do not meet the demands of the international literacy standard. Reading comprehension is crucial to being at ease with texts encountered. According to Wenglinsky⁹⁷, research studies have labelled instructional factors that appear to be useful in teaching reading comprehension.

Barrett's and Bloom's taxonomies are used to test the listening and reading, and speaking and writing respectively. Sub-skills and levels will determine the level of difficulty on tests of listening, reading, speaking and writing. Such levels will be detailed in the next chapter (chapter four), where more emphasis is placed on Barrett's taxonomy and less on Bloom's taxonomy.

This chapter will focus on reading comprehension, listening comprehension, correlations between reading comprehension and spoken language comprehension, text types, teaching comprehension, and the use of comprehension taxonomies.

3.2. Reading comprehension

Reading comprehension consists of all of the processes associated with deriving meaning from written language (which comprises books, magazines, text displayed on projectors, computers, mobile devices and all other forms of written language) and constructing meaning from written language. When a reader notices that there is meaning in a text and understands that meaning, he/she has derived meaning. When the same reader goes beyond the meaning

⁹⁷ Wenglinsky H. 2003 Education Policy Analysis Archives, 11, 19

explicitly contained in the text and adds to that meaning based on his/her own experience and ability to infer additional or deeper meaning, he/she has constructed meaning. Therefore, reading comprehension is far more than the ability to read specific words and recognise what those words mean. When the reader comprehends, he/she must be able to understand the author's meaningful statement. In examining tasks for the teaching of reading skills, one useful activity centres on a discussion of Barrett's taxonomy of levels of reading. Before we delve into the whole matter, it is important to gaze at the history of comprehension skills.

The importance of teaching reading comprehension skills has long been a major topic of research amongst educators. In 1917, Edward Thorndike (a psychologist famous for his work on learning theory) reported the first analysis of comprehension after he studied reading errors made by students. He noted the fundamental importance of word meanings when he wrote of the "over-potency" and "under-potency" of certain words⁹⁸. Thorndike, as stated in the literature review, was the educational psychologist who initiated inquiry into the complex thought processes linked with comprehension. He regarded reading "as reasoning", suggesting that the process consists of many factors. He also assumed that there are such things as "correct" readings. He further argued that in the act of reading, the mind needs to organise and analyse ideas from the text - "the vice of the poor reader is to say the words to him without actively making judgments concerning what they reveal"⁹⁹.

Two years later in 1919, W. S. Gray enumerated eight skills of comprehension in the Eighteenth Yearbook of the National Society for the Study of Education¹⁰⁰. Most of the errors found in a number of studies by several researchers¹⁰¹ who studied comprehension fit into wide-ranging groups of skills of reading comprehension. In these studies, as in others, both the literal and inferential dimensions of comprehension became obvious. In 1927 while studying comprehension of detailed directions, Carroll concluded that errors were frequent in sentences containing implied material.

A collection of techniques was used in comprehension studies in attempts to determine specific skills involved in comprehension. Multiple-regression studies have provided data on

⁹⁸ Thorndike E., 1917 a, *Journal of Educational Psychology*, 8, 323-332. (Reprinted in *Reading Research Quarterly*, 1971, 6, 425-434), 1917b *Psychological Review*, 24, 220-234 , 1917c *Elementary School Journal*, 18, 98-114

⁹⁹ Thorndike E., 1917, p. 332

¹⁰⁰ Gray W.S., 1919, pp. 26-51.

¹⁰¹ Carroll R. P., 1927; Richards I. A., 1929; and Albright B. F., 1927

substrata factors involved in reading. Other studies¹⁰² have researched procedures to estimate the unique non-chance variance of reading tests. Johnson¹⁰³ discussed the factors of reading comprehension. She concluded that comprehension in reading does not seem to be quite such a simple matter. At the moment, accepted tests of reading ability do not measure all of its components.

In 1948, a group of educators began developing a classification system of education goals and objectives for the cognitive, affective and psychomotor domains. *Bloom's Taxonomy of the Cognitive Domain* was completed in 1956. The major idea of the taxonomy is that what educators want students to know can be arranged in a hierarchy that ranges from less to more knowledge. Students can "know" about a topic or subject at different levels. While most teacher-made tests still test at the lower levels of the taxonomy, research has shown that students remember more when they have learned to handle the topic at the higher levels of the taxonomy.

In 1966, Robinson expanded on Gray's model of the reading process. In it, comprehension includes: (a) understanding the literal meaning of a writer; (b) understanding the implied meaning of a writer; (c) assessment of a writer's purpose, frame of reference, assumptions, and generalisations; (d) evaluation by the reader of the writer's ideas and (e) integration of information and ideas of a writer with the reader's information and related experiences¹⁰⁴.

A construct which explains the intellectual processes employed by a reader for comprehension of the language of the writer or speaker was proposed by Cleland¹⁰⁵. He itemised six factors in comprehension: a) perception; b) apperception; c) abstraction; d) appraisal; e) ideation and f) application. He believes the critical element in perception is the meaningful response rather than simple recognition. Apperception is referred to as the process of relating new material to one's background experiences. These first two factors (perception and apperception) of Cleland's model relate precisely to factors referred to by some authors as "literal" and "inferential" reading comprehension.

In the late 1960s, eight skills of comprehension were measured, including skills dealing with literal comprehension and skills calling for inferential comprehension¹⁰⁶. There is evidence of

¹⁰² Harris, 1948; Flanagan, 1959; and Shaycroft, 1964

¹⁰³ Johnson, M. S., 1949, 35, 385-406.

¹⁰⁴ Robinson, H. M., 1966, pp. 22-32

¹⁰⁵ Cleland 1965, 10, 59-64

¹⁰⁶ Davis, 1968, 3, 499-545

the exclusivity of certain reading comprehension skills but there are no tests that actually measure these specific skills. Davis (1968) specified the projected unique non-chance variance in each of eight fundamental skills of comprehension in reading. Among such skills are a) determining the central thought or the most important idea of a selection; b) securing information which will aid in the solution of a problem; c) determining the lines of argument which support the point of view of the author and d) determining the validity of statements.

In 1968 a taxonomy of reading comprehension designed by Thomas C. Barrett was reported by Theodore Clymer. This taxonomy delivers an ordered presentation of categories of reading comprehension which is as follows: a) literal; b) reorganisation; c) inferential; d) evaluation; and e) appreciation. Literal comprehension, according to Barrett, focuses on ideas and information explicitly stated in the reading selection and inferential comprehension demands thinking and imagination that goes beyond what is on the printed page. The first and third categories of Barrett's taxonomy seem to require skills similar to those in Clealand's perception and apperception factors.

More models, theories, constructs, and taxonomies have been devised by a large number of researchers¹⁰⁷ who investigated aspects of reading comprehension. These researchers seem to reach the conclusion that there is indeed some kind of hierarchy of reading comprehension skills. Even though there is disagreement over the specific types of comprehension skills involved, the majority of studies have found reading comprehension to be composed of two broad categories, which are literal comprehension and inferential comprehension. Nevertheless, with such general agreement concerning the skills involved in reading comprehension, there are few tests available to measure the two skills. However, research shows a need for teaching and testing specific comprehension skills.

Meaningful reading cannot take place without a purpose. Without comprehension, reading is simply following words on a page from left to right while sounding them out. The words on the page have no meaning to the reader. While people read for many different reasons, the chief goal is to derive some understanding of what the writer is trying to convey and make use of that information – whether for fact-gathering, learning a new skill, or for pleasure. This is why reading comprehension skills are so important. Without them the reader cannot gather information and use it to function efficiently and enjoy the richness of life. Although proficient readers may not always explicitly state their reasons for reading specific selections,

¹⁰⁷ Singer, 1965,10, 325-331; Fagan, 1971, 25, 169-175; Simon, 1971, 338-364; and Davis, 1972, 7, 628-678

they always have a purpose. A purpose determines the strategies that readers use and what they will remember from their reading. If no specific purpose exists, reading has a tendency to be haphazard and may lack any tangible significance.

The effects of reading comprehension on literal and inferential comprehension were tested by Pettit¹⁰⁸. Experimental groups were instructed to read to find answers to questions calling for stated or implied meanings and to complete three practice exercises. Pettit found such direct instruction did not significantly affect achievement on measures of either literal or inferential reading comprehension. However, she did find achievement to vary considerably within these dimensions of reading. She also noticed a need for reading comprehension tests with subscales to measure specific comprehension tasks to help improve the teaching of these skills.

Learning transfer is positive when the acquisition of one skill or concept aids the acquisition of another. Despite the fact that reading skills have positive correlations with one another, no study was found showing positive transfer of learning from one skill to another. Until further evidence comes to light, it is necessary to test and teach specific skills without reliance on transfer of learning between skills. Agreement among teachers and researchers indicates the need to test and teach a minimum of two general comprehension factors, literal and inferential, and to formulate test items which will expose specific skills within these general factors.

3.3 Listening comprehension

3.3.1 Overview

Listening comprehension is more than hearing what is being said; it is a hearer's ability to understand the meaning of the words he/she listens to and to recount them in a particular fashion. Principled listening comprehension skills enable learners to listen to a story, understand it, deliberate on it, and even paraphrase it in their own words. Teachers usually use the Barrett's Taxonomy in the testing of listening.

The most common form of communicating is speaking out loud, and learners can succeed in this skill if they can learn to completely understand what is being said. Patterns of speech, where the emphasis is placed in a sentence, tone of voice, and pauses between words all have an effect on the meaning of the words being spoken and the message they are intended to convey.

¹⁰⁸ Pettit N. T., 1970

Listening comprehension is an important skill which learners must learn and practice. Undoubtedly, there is more to teaching listening comprehension than playing an audio device and thereafter requesting learners to answer questions. Listening comprehension, in many language classrooms, is seen as a less important skill. People need to bear in mind that speaking in itself does not facilitate communication unless what is said is comprehended by another person. Certainly, it shows the significance of listening comprehension, and indicates that teachers must allot a substantial amount of classroom time to teaching and practising it. As we live in a world of sound throughout our lives, our time is spent more on listening than reading, writing or speaking¹⁰⁹.

A person cannot understand auditory messages in a language, unless he/she has command over key components of that language. Such components may be syntax (sentence structure), phonology (sound structure), text structure (conventions that determine how events and assertions in narratives and expositions are typically structured), and semantics (word meanings and the relationships between meanings). Listeners have to, at the phonological level, be in a position to make a distinction between phonemes of the language. They also need to be sensitive to intonation patterns (rising and falling pitch) that offer cues in order to ascertain whether the statement is a declaration, question or command;

e.g.

a) You are going to pass this year. (Declaration).

b) You are going to pass this year? (Question).

c) You are going to pass this year! (Command).

They also need to recognise cues regarding form, e.g.:

1) Inflections for verbs like

- ed = comprehended

- ing = comprehending

2) Inflections for adjectives like

- er = elder

- est = eldest,

as well as sentence position cues like subject, verb, and object slots.

Learning to listen and comprehend is not only a requirement for reading comprehension, but also delivers a rich resource for learners to draw upon when they want to convey their own thoughts and feelings. Listening is an essential skill to develop because good listeners mature

¹⁰⁹ Morley, J. M. 1991, Second Edition, pp. 81-106.

to become respectable communicators.

3.3.2. The Importance of pre-listening activities

Before undertaking a listening activity, learners have to do certain things in order to prepare for listening. Such activities are called pre-listening activities and have various purposes, including pre-teaching or stimulating vocabulary, predicting content, generating interest and understanding of a task. For example, if learners are going to listen to a radio programme about over-eating and obesity, before listening, they might work in groups to express their knowledge of over-eating and obesity and then relate their experiences to the rest of the class. Pre-listening tasks in the classroom include brainstorming the topic, vocabulary work, answering discussion questions, determining whether statements are true or false, and prediction tasks. The activities selected during pre-listening may act as groundwork for listening in several ways.

Pre-listening activities may include reading something relevant, predicting the content of the listening text, doing guided practice, reviewing vocabulary or grammatical structures, going over the instructions for the activity, fashioning semantic webs, and looking at graphs, diagrams, maps, or pictures.

Teachers should always provide some suitable pre-listening activities which will stimulate learners to contemplate the topic and assist to set in motion the factual script. Moreover, an experienced teacher could use the pre-listening stage to find out what learners already know. This may help to pre-teach the language or vocabulary that learners will need to thrive in their listening task.

Learners, on the other hand, require assistance in constructing and activating scripts before they are requested to confront a listening task. Richards¹¹⁰ contends that the use of pre-listening activities is also a significant aid to actually teaching listening comprehension, as opposed to simply testing it. Obviously, pre-listening activities have an important role to play.

3.3.3. Materials used to teach listening comprehension

When teaching listening comprehension, teachers should look at the type of materials they use. According to Richards¹¹¹, a lot of textbooks have stilted, artificial dialogues which bear no resemblance to real speech. Learners taught using such materials are expected to struggle

¹¹⁰ Richards, J. C., 1983, pp. 161-176.

¹¹¹ Richards, J. C., 1983

when they come across language-in-use.

CDs have, in the past decade, substituted cassette tapes as the primary way to present listening materials. They are easy to use, inexpensive and can expose learners to an extensive range of accents and listening situations. Recordings are time-saving for teachers and also expose the listener to many different accents, moods and voices.

Movies, television shows, or even invited speakers can be used to vary classroom activity and to make the listening more real for the learners. According to Ur, "both recorded and live speech should have a place in the classroom"¹¹². There is no reason to limit ourselves to using only recorded materials. It is expedient to see the person who is speaking. The speaker's body language also offers countless extra clues to assist in understanding what is being said.

Video tapes are visual materials that present the benefits of letting learners see the speaker. Exposure to non-linguistic information or context also aids understanding. Authentic visual materials demonstrate the difficulty of the language and are not accessible to novices. When using recordings, teachers also have more control over the pace of listening, and it normally has a positive consequence on the learner's attentiveness. Teachers regularly use short and easy authentic recordings recommended by textbooks for listening for understanding purposes and visual materials for listening for perception outcomes.

The desire of the school system to incorporate ICTs into classrooms originated two decades ago with linguistic research. Thereafter, teachers enhanced their classes with modern material such as recordings, CDs, television and the radio. The use of these materials was indeed an improvement but that strategy remained stagnant until the arrival of MALL. According to Kukulska-Hulme, & Shield¹¹³, academics have noted that MALL offers learners expedient, rich, real-time learning opportunities. The MALL offering is important because it benefits learners whether they are inside or outside the classroom. Mobile learning has the potential to allow creative instructional approaches to be carried out in a language classroom.

MALL also plays a vital role in the learning and use of new language skills¹¹⁴. Learners, according to researchers' findings, pay most attention to captions, followed by audio and video, and connect them with visual images. Their belief is that captioned video tends to aid recognition of written word forms and the learning of word meaning while, contrariwise,

¹¹² Ur, P. 1984, p. 25

¹¹³ Kukulska-Hulme, A., Shield, L. 2008, 20(3), 271-289

¹¹⁴ Hashemi M. & Ghasemi B. 2011 2947-2951

Winke, Gass, & Sydorenko¹¹⁵ found that non-captioned video has a tendency to advance listening comprehension through its presentation of aural word forms.

Thornton & Houser¹¹⁶ encouraged learners to use mobile phones to access video clips explaining English idioms. Stockwell, on the other hand, emphasises that today's learners are devoting more of their time to using mobile devices rather than PCs to execute learning activities¹¹⁷.

3.4 Reading and spoken language comprehension

In order to thrive in reading, a learner must be able to recognize printed words and understand the text or story composed by these words. Oral language competences need to be bettered so that learners can increase reading and language success. Researchers who study the development of language highlight the fact that oral language development is the basis for written language development.

Learners' oral language competence is indicative of their facility in learning to read and write. A learner's listening and speaking vocabulary, coupled with syntactic proficiency, determines what they can read and understand, irrespective of the way in which they can interpret.

Table 1; Reading and spoken language comprehension



Indeed, it is true that listening comprehension can be different from reading comprehension. When learners are reading a text, their brains comprehend words almost immediately. They may rely on their sight for comprehension, but to listen and comprehend at the same time they must depend wholly on their ears.

Although there are many parallels between listening comprehension and reading comprehension, there are also differences. The most noticeable difference is that with

¹¹⁵ Winke, P., Gass, S., & Sydorenko, T. 2010, 14(1), 66-87

¹¹⁶ Thornton, P., & Houser, C. 2005, 21: 217-228

¹¹⁷ Stockwell, G. 2010, 14(2), 95-110

reading, words must be decoded from print. However, there are other dissimilarities in addition to this difference. For instance, when a learner is engaging in reading comprehension, the author cannot modify the text to fit each learner because the text is fixed. In the case of listening, the speaker usually pays attention to whether he is being understood and, if not; he can do something to better the listener's comprehension. Similarly, readers cannot ask for clarification from an author, but listeners can ask speakers for clarification. It is therefore evident that there is a burden of comprehension on readers that is superior to that placed on listeners.

Listening comprehension is something that develops fairly naturally for most learners without any direct endeavour on teachers' part to teach them how to comprehend. But at the same time, as Durkin¹¹⁸ points out, teachers go to great lengths to teach learners how to comprehend the written word. Teachers afford learners with countless opportunities to practice comprehension skills.

The idea that the acquisition of reading comprehension involves learning to understand writing as well as spoken language has pragmatic justification. The correlations between reading and spoken language comprehension are fewer when one begins to learn to read¹¹⁹. At this stage, word-reading processes limit comprehension because learners are learning to decode and identify words. The correlations between reading comprehension and spoken language comprehension will rise as learners move away from the early stages of learning to read. The restrictive factor in reading comprehension shifts from word recognition to spoken language comprehension as learners learn to read words.

Through this understanding, developed in the preceding paragraphs, it is clear that that reading comprehension is the combined product of recognising printed words and listening comprehension.

3.5 Text types

Teachers need to make sure that the general content of the passage is appropriate for learners. Teachers also need to consider the nature of the text learners are asked to read/listen to. The general format (print size, font, headings, graphics, sound volume, etc.) should be within learners' ability to handle. They should ensure that the text is readable for learners, and it needs to be written at a level that is proportionate to learners' reading skills. If it is a listening

¹¹⁸ Durkin D, 1978 Reading Research Quarterly 14 (4), 499-533

¹¹⁹ Curtis, 1980, 72, 656-669; Sticht & James, 1984, 293-317

text, it must be audible and the teacher must make sure that learners listen attentively. Teachers must consider the general type or genre of text given to learners to read/listen. Elementary classrooms are inclined to have stories or narrative as the primary genre. This is commonly followed by informational or expository texts.

There are other forms of text such as poetry, riddles, song lyrics, jokes, rhetoric scripts, and so on. Each of these genres places different comprehension demands on the learner. For instance, text structure varies according to genre - narratives are likely to be linear and chronological in their structure whereas informational texts tend to be hierarchical and logical in their structure. Poetry tends to have a different structure than the previous two kinds of text. Learners expecting to read or listen to narrative but then given informational material will have substantial difficulty in making meaning.

Ideal reading instruction acquaints learners with an extensive variety of text types and genres. Teachers, then, need to assist learners to work through the multiplicity of text types and structures they may come across, from the large differences between texts to the more delicate and nuanced distinctions that may still have an influence on if and how a learner grasps a text.

3.6 Teaching comprehension

Comprehension teaching can be complex and multifaceted. Teachers need to guarantee that learners have the basic interpreting skills and fluency and adequate vocabulary and contextual knowledge for the text to be read or listened to. They must select texts correctly – for instance, a good balance between narrative, informational, and other genres should be established and texts should be at the right level of difficulty. Teachers also need to decide on various comprehension strategies. Teachers need to be mindful of the level of support learners need in the process of reading/listening and learning. This will enable them to use various comprehension strategies.

A model of instructional support called the Gradual Release of Responsibility Model was proposed by Pearson and Gallagher¹²⁰. Such a model recommends three levels or phases of teacher-learner responsibility in any sort of learning, especially when learning to comprehend text.

In the first phase, most of the responsibility for the lesson lies with the teacher because it is in

¹²⁰ Pearson, P.D., & Gallagher, M.C. 1983, 8, 317-344

this phase where the teacher will explain to learners the methods and strategies that they are to learn. It is the teacher who must describe the process or strategy, give examples of the process from other tasks with which learners are accustomed, and apply and demonstrate the process for learners to view on their own. The teacher must, during this presentation, explain to learners what he/she is doing and what he is thinking. He must take that which is implicit and explicit.

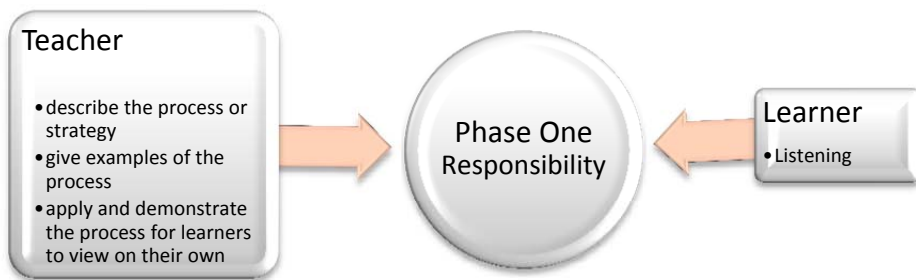


Figure 1 Gradual Release of Responsibility Model, Phase One Responsibility

In the second phase, both the teacher and learner take responsibility for implementation of the model. Different portions of the task may be delegated, or the task may be done together by both learners and the teacher. The teacher may act as an observer while learners are working, give feedback and evaluation, and encourage learners' work. It is in this phase where the teacher will gradually pull away from the task, letting learners take responsibility to a great extent.



Figure 2 - Gradual Release of the Responsibility Model, Phase Two Responsibility

In the final (third) phase learners are in total control of the implementation of the process. By now, learners will have developed ownership of the strategy and will be in a position to apply it at whatever time they feel necessary. Support from the teacher is minimal as they will be working on their own (unless support is requested). The main objective for learners will be to develop skill and fluency in the implementation of a particular strategy and incorporate it into their own collection of reading strategies.

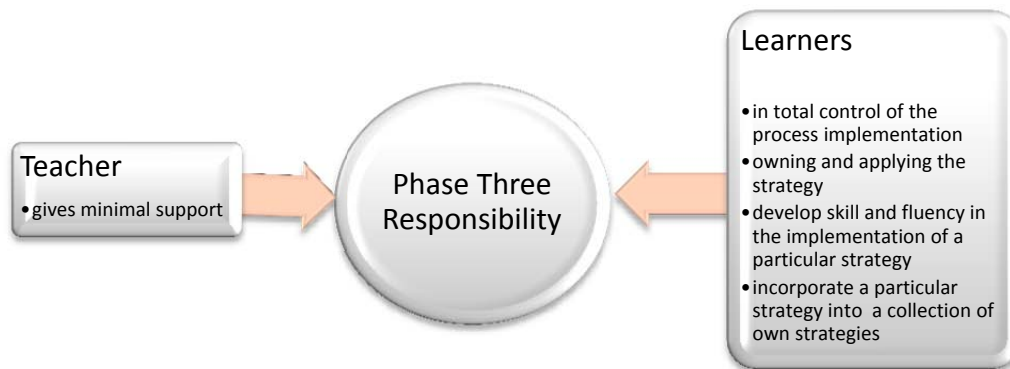


Figure 3 - Gradual Release of the Responsibility Model, Phase Three Responsibility

In order to assist learners to extract meaning from texts, it is important that teachers give explicit instruction in comprehension strategies. This involves offering the basis for the strategies, modelling and providing autonomous supervisory practices in realistic contexts. According to Pressley¹²¹, certain mechanisms of comprehension strategies that are essential in understanding texts in general comprise (a) activating prior knowledge; (b) question-generating; (c) image-constructing; (d) summarising and (e) identifying important information in texts. It is therefore important for teachers to encourage learners to consider the dissimilarities in the structure of narrative and expository texts. Teachers ought to be well-informed about the comprehension strategies required to deal with the disparities in the text structure.

In initial grades, reading of narrative texts is generally used in classrooms. Many learners find the reading pattern of narrative to be predictable. Yopp and Yopp and Walsh & Blewitt¹²² believe that narratives are normally organized in a story form: narrative texts have characters, a plot and settings, and are chronologically ordered and goal-based. Narrative texts typically use everyday vocabularies. There is a difference, however, between expository texts and narrative texts. The chief dissimilarity between informational or expository texts and narrative texts is that expository texts entail features such as generic knowledge, technical vocabulary and headings. When learners understand how reading patterns differ from narrative to expository texts, they are being guided by explicit and direct instruction.

Informational texts stimulate discussions and serve as a catalyst for children's interest¹²³. They form the main part of learners' reading from grade four up to secondary school. They promote many purposes such as:

¹²¹ Pressley, M. 2000. 2, 609-640

¹²² Yopp, R. H. and Yopp, H. K. 2000, 53, 410-423; Walsh, B. & Blewitt, P. 2006, 33 (4): 273-278

¹²³ Yopp, R. H. and Yopp, H. K. 2006, 38(1) 37-51

- a) acting as sources of answers to learners' questions about the world;
- b) assisting in building and refining schemata crucial to text comprehension;
- c) exposing learners to particular vocabulary in each of the genres and
- d) providing information about rich language patterns and diverse text structures.

Reading/listening comprehension is a process by which individuals learn. It is the teachers' duty to assist learners to become conscious of this process and to use it in their own reading/listening. It is a considered, dynamic, strategic, and multi-dimensional process that learners employ to take in new meaning from the written/heard text and incorporate it into their existing knowledge structures. Comprehension is not something that occurs extemporaneously in the mind of learners as they engage with print. It gives the learner access to a new level of active understanding and insight. It enriches linguistic knowledge. A range of comprehension strategies is applied by principled learners who will be in a position to use specific strategies to support their comprehension, predominantly with regard to difficult/confusing texts¹²⁴.

When comprehending, learners interpret, integrate, critique, infer, analyse, connect and evaluate ideas in texts. They process text beyond word-level to get to the bigger picture. When working together, they assign several meanings not only in their minds, but also in the minds of others. Learners reveal their understandings of texts in different ways. According to the State of New South Wales Department of Education and Training¹²⁵, learners - when comprehending - realize and recall information, draw on the knowledge of text structures and text organisers, write short reflective responses, complete multiple choice questions, think deeply and express ideas verbally, complete descriptions, recognize causal relationships, make logical connections, interpret graphics and images and identify multiple points of view and specific details.

Teachers and parents who have knowledge and experience in using reading/listening comprehension strategies must teach learners reading/listening comprehension over an extended period of time. They must refine, practise and reinforce such strategies repeatedly throughout life. A learner cannot, after having learned to read/listen once, be in a position to explain any text that comes his way. It is the responsibility of teachers and parents to continue to assist their learners/children to develop reading/listening comprehension strategies.

¹²⁴ Pressley, M. 2002a, pp. 11–27

¹²⁵ NSW DET 2010

Learners must acquire new implements for comprehending texts as their reading materials become more diverse and challenging. Diverse comprehension strategies are necessary as content area materials like textbooks and magazines pose different reading comprehension challenges for learners. Due to the varying complexity of the text a person will read, the development of reading comprehension is a continuous process.

3.7 Applying comprehension taxonomies

Comprehension taxonomy is a classification of comprehension questions into categories like recall, inference, and extrapolation. No category can be said to be more advanced than another. These categories endeavour to streamline conflicting terminology related to comprehension and thus reorganise the perplexing selection of skills labels.

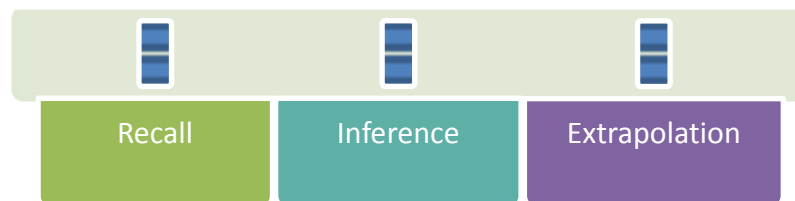


Figure 4 - Classification of Comprehension Questions

There are two different definitions of the term “taxonomy”, and this causes ambiguity. The first definition comes from Klausmeier¹²⁶ who uses “taxonomy” to mean a classification system only. Taxonomies’ authors, though, have not agreed on the number of categories to use, nor have all the authors used the same labels for comprehension skills. On the whole, each taxonomy consists of a distinct category for recall of explicitly stated ideas in a passage, inferences, and evaluating and making judgments about the material that has been read. A second definition for the term “taxonomy” shifts the taxonomy’s role from that of describing separate categories. Bloom¹²⁷ uses “taxonomy” to define a hierarchy in which behaviours are ordered in terms of their difficulty. Proficiency in the behaviour in one category is said to be essential before performance of the behaviour in the next category is possible.

Wallen¹²⁸ explains that the objectives in his taxonomy are successive and cumulative, and the thinking process involved in each lower skill is made use of in each higher one. Consequently, skills range from simple to complex – “interpretation” calls upon “recall”, “extrapolation” necessitates both “interpretation” and “recall”, and “evaluation” needs all three skills. It is through the second definition that one understands why writers of

¹²⁶ Klausmeier 1976

¹²⁷ Bloom, B. S. 1956

¹²⁸ Wallen, C. J. 1972, p. 306

comprehension taxonomies have revised Bloom's definition.

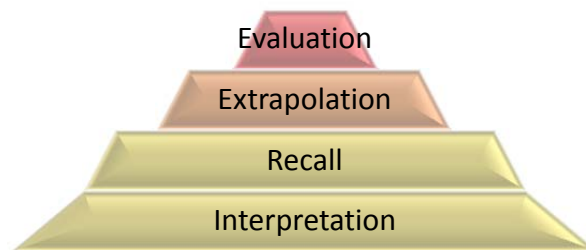


Figure 5 - Skills range from simple to complex

Teachers use comprehension taxonomies when they are confronted with devising a system to construct their own questions. The taxonomy describes numerous types of questions that could be asked from learners in each category. For instance, in the Barrett taxonomy, the appreciation category is segmented into four parts: emotional response to the content, identification with characters or incidents, reactions to the author's use of language, and imagery. These four areas may well be used by teachers as a catalyst for developing an extensive range of questions centring on learners' emotional and aesthetic responses to what they have read.

When dealing with assessment, teachers can design a checklist that may be used to record the way in which each learner responds to questions from every category of the taxonomy. Such a checklist will gather learners' responses to written comprehension questions along with the reading group's discussion questions. Armed with such material, teachers will create lesson plans which take into account the specific comprehension needs of each child. This will allow the teacher to group learners who performed badly in a particular area of taxonomy for another lesson in that area.

Using comprehension taxonomies, a valuable system for analysing instructional materials can also be developed. As it is important to know if classroom materials centre on one or two types of questions to the exclusion of others, teachers can measure the degree to which questions in the learners' materials and in the associated teacher's guidebook are disseminated over each category of the taxonomy. This will assist the teacher to deliver activities that will include learners' answers into other categories of the taxonomy. For instance, recall questions may prompt the teacher to use the taxonomy in planning more questions necessitating reorganisation and inference.

Those who believe that comprehension taxonomies delineate progressive stages in learners' cognitive responses to written materials it is no longer an accepted idea that they must think again and stop misrepresenting the idea. We need to think of comprehension taxonomies as

classification systems and not as learning hierarchies. They are regimented systems for shaping types of reading performance under defined labels. Such labels are observed when teachers are in need of categories in which to place comprehension questions, and are also applicable tools to make use of a variety of questions within their teaching of comprehension.

There is ample evidence that recall questions are asked in lower grades by teachers more often than any other kind of question (inferential or evaluation ones). Motives for this tendency are diverse¹²⁹ and depend on the teacher's beliefs about reading comprehension. There are three considerations to take into account regarding the aforementioned: a) the teacher is restricted to questions requiring recall, the level of taxonomy where young learners can succeed because they are unable to deal with inferential and critical thinking questions; b) recall questions are an effective means of assessing whether or not learners have read, as they should, every word in a given story and c) recall questions should precede all other types of questions when a reading selection is discussed, because learners must know the facts and details from the passage before they can answer other types of questions, like inferential or evaluation ones.

It is very important, therefore, for teachers to avoid developing a distorted idea of what reading is. If they begin their discussions of stories with a barrage of recall questions, learners will develop the belief that these are the most important kinds of responses. This will also happen if teachers limit themselves to using instructional materials that highlight recall questions above all others.

The three widely held considerations have their own shortfalls. Teachers might support their practices by concluding that, as recall is on the lowest level, it needs to be taught first before proceeding to higher, more difficult levels. Inferences, then, will follow. After the first three levels have been grasped, a teacher would incorporate evaluation questions. As it has been stated earlier that comprehension taxonomy is only a classification system, teachers must resist using it as a description of how comprehension skill develops. The notion that young readers respond best at a recall level due to their limited reading skill and cognitive development has not been tested, and cannot be relied upon.

Asking learners an extensive variety of questions and thus avoiding placing unwarranted emphasis on recall will help accomplish this understanding (that comprehension taxonomy is only a classification system). Concentrating on recall at the foundation stage is ill-advised

¹²⁹ Guszak, F. J. 1967, 21(3), 227-234

and not supported by the reality of these taxonomies. Teachers should endeavour to draw from their learners a range of responses to what they read right from the very start so that learners can understand the development of comprehension skills.

3.8 Barrett's Taxonomy

A number of comprehension taxonomies for assessing and teaching comprehension skills were developed in the past six decades¹³⁰. They have been hailed as a worthwhile tool. These taxonomies can boost a teacher's effectiveness. After reviewing other contemporary works in reading comprehension, Theodore William Clymer introduces Thomas C. Barrett's "Taxonomy of the Cognitive and Affective Dimensions of Reading Comprehension".

Barrett's taxonomy is loosely related to Bloom's¹³¹ "Taxonomy of Educational Objectives". He borrowed from Bloom's paradigms of knowledge, comprehension, application, analysis, synthesis, and evaluation. He applied the taxonomic frame attributed to Bloom in order to structure his groundwork for reading comprehension. Barrett's taxonomy splits reading comprehension into five primary categories which encompass the numerous behavioural tasks that a learner must achieve in order to comprehend according to Barrett's definition. Such categories are a) literal comprehension; b) re-organisation; c) inferential comprehension; d) evaluation and e) appreciation. It is a fact, according to Clymer, that the logical presentation of categories may promote a better precision than the classification system really possesses. He believes in the importance of the taxonomy in developing purposes and questions for structuring learners' reading and for analysing the questions to determine what varieties of comprehension are emphasised in the selections.

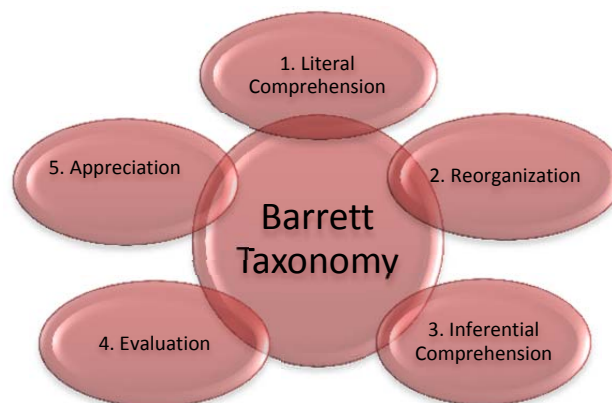


Figure 6 - Barrett taxonomy's five foremost categories

¹³⁰ Sanders, N. M. 1966, Barrett T. 1968, Wallen, C. J. 1972

¹³¹ Bloom, B.S. 1956

Barrett's primary categories have been well-organised according to complexity in terms of the inferential thought requirements each category seems to demand¹³². Inferred thought requirements accentuate the fact that comprehension taxonomies have been planned according to theory rather than empirical research. Due to the lack of research supporting the idea that comprehension taxonomies are established learning hierarchies, it is more suitable to use them only as systems for categorising comprehension activities. Therefore, there is no judgment made regarding the sequential presentation of questions to learners. Barrett's taxonomy may be of more value for research purposes in understanding the various components of the reading process at all of the various levels of reading comprehension.

Barrett incorporated familiar terms such as "main idea", "sequence", "comparison", "cause-effect relationships", and "character traits" into his taxonomy. While he did not select a tabular format for presenting, a five-category taxonomy that is worthwhile in understanding how readers comprehend was developed¹³³. Barrett's first category is literal or factual comprehension, which refers to the simple understanding of information that is explicitly stated in the text. The second level, which is reorganisation, obliges a learner to recall from memory information explicitly stated in the text. The third level, which is inferential comprehension, refers to information that is implied or not explicitly stated in the text. The fourth level, critical or evaluative comprehension, involves the reader making judgments about various aspects of the text which are: its literary quality; the competency of the author; the righteousness of the characters and their actions, and so forth. The fifth level necessitates that the learner express emotional and aesthetic responses to the text in compliance with personal and professional standards of experience, theories, literary forms, styles, genres, etc.

3.8.1. Literal comprehension

Recognition or recall of a single fact or incident may be regarded as a simple task in literal comprehension. A more intricate task might be the recognition or recall of a series of facts or the sequencing of incidents in a reading selection. Literal comprehension requires the student to focus on ideas and information explicitly stated in a text.

3.8.1.1 Recognition or recall of details, e.g.:

- a) What was the event or action?
- b) How did it happen?
- c) What had happened?

¹³² Barrett T., 1968, 17–23.

¹³³ Clymer, T., 1968, 7-29.

3.8.1.2. Recognition or recall of main ideas, e.g.:

- a) What was the theme of the poem/summary/ novel/?
- b) What happened throughout the story?
- c) What is the key idea of an individual paragraph?

3.8.1.3. Recognition or recall of a sequence, e.g.:

- a) What events?
- b) What actions?
- c) What items?
- d) In what order did it happen?

3.8.1.4. Recognition or recall of comparisons, e.g.:

- a) Likeness or differences among characters that are explicitly compared in the text
- b) Likeness or differences of events that are explicitly compared in the text
- c) Likeness or differences of places that are explicitly compared in the text

3.8.1.5. Recognition or recall of cause-effect relationships, e.g.:

- a) Recall reasons for certain actions explicitly stated in the text
- b) Recall reasons for events explicitly stated in the text
- c) Recall the results of certain actions explicitly stated in the text
- d) Recall the results of events explicitly stated in the text.
- e) Recall reasons for character motives
- f) Recall the results of character motives

3.8.1.6. Recognition or recall of character traits, e.g.:

- a) Facts explicitly stated in the text about a character (name, traits, feelings, variables),
- b) Facts explicitly stated in the text about the setting of the story, or
- c) Facts explicitly stated in the text about the time the story takes place.

3.8.2. Reorganisation

Reorganisation requires a learner to recall from memory information explicitly stated in the text. Reorganisation tasks are:

3.8.2.1. Classifying

In this case a learner is required to place people, events, places and/ or things into categories. When learners are asked to recognise or recall certain kinds of details, relationships, traits, etc., they are basically classifying.

e.g.; Read each phrase below. Does it tell you “who,” “what,” “when,” “how,” or “where?”

- a) Which of the following _____ does not belong?
- b) Which of the following are time frames?
- c) Place the following under the proper heading.
- d) Classify the following according to their species.
- e) “Floated at this point.” (A phrase taken from a selection)

3.8.2.2. Outlining

A learner is asked to organize the selection in skeleton form using paraphrased statements or statements quoted directly from the selection e.g.:

- a) Complete the following outline.
- b) Organise the facts into main headings and subheadings to form an outline.
- c) Divide the story into two parts.

3.8.2.3. Summarising

A learner is asked to summarise the selection using direct or paraphrased statements from the selection e.g.:

- a) What has happened up to this point?
- b) Tell the story in your own words.

3.8.2.4. Synthesising

In this instance, the student is requested to consolidate ideas or information from more than one source. More is required than just collecting information; information must be fused so that information from more than one source provides a single answer to a question. Synthesising e.g.:

- a) How long did the entire _____ last?
- b) Fill in your time line.
- c) What was the speed of the _____?
- d) Did _____ have enough _____?
- e) Compute _____.
- f) How many times did _____ take place?
- g) On what day did _____ happen?
- h) Figure out _____

3.8.3. Inferential comprehension

Inferential comprehension requires the student to use information explicitly stated in the text along with personal experience and knowledge in order to form hypotheses. It also requires a

learner to blend the explicit content of a selection with prior knowledge, intuition, and imagination to form hypotheses. Inferential comprehension is often described simply as the ability to read between the lines.

Inferential comprehension may be either convergent or divergent in nature and learners may be asked to verbalise the underlying rationale. Reading for inferential comprehension demands thinking and imagination that go beyond the printed page.

Barrett's Taxonomy of Reading Comprehension¹³⁴ identifies the following eight subtasks that enable students to make inferences:

- 3.8.3.1. Inferring supporting details: requires the student to conjecture about information that might have been included in the text. In other words, the student makes guesses about additional facts the author could have included in the selection that would have made it more informative, interesting, or appealing.
- 3.8.3.2. Inferring the main ideas: providing the main idea, general significance or theme that is not explicitly stated in the selection.
- 3.8.3.3. Inferring sequence: requires the student to conjecture about what might have occurred in addition to explicitly stated events; includes conjecture about events that may have taken place beyond the completion of the text.
- 3.8.3.4. Inferring comparisons: inferring likenesses and differences in characters, times, or places.
- 3.8.3.5. Inferring cause-and-effect relationships: requires hypothesising about the motives of characters and their interactions with others and interactions with time and place.
- 3.8.3.6. Inferring character traits: requires hypothesising about the nature of characters on the basis of explicit clues presented in the selection.
- 3.8.3.7. Predicting outcomes: requires the student to hypothesise about the outcome of the text after considering a portion of it.
- 3.8.3.8. Interpreting figurative language: requires inferring literal meanings from the author's figurative use of language.

3.8.4 Evaluation

Evaluation requires the learner to compare information and ideas in a text with material presented by the instructor or other authorities and with the student's own knowledge and experience in order to form judgments of various kinds. Evaluation deals with judgment and

¹³⁴ Barrett, T. C. 1974

focuses on qualities of accuracy, acceptability, desirability, worth or probability of occurrence. Evaluative thinking may be demonstrated by the following judgments:

- 3.8.4.1. Reality and fantasy judgments: The learner may be asked to express and support an opinion about whether characters, actions, or events in a story could have existed or occurred in real life. The learner may have to answer a question like: "Could an event like this really take place?"
- 3.8.4.2. Fact or opinion judgments: In this instance the learner is requested to express and support an opinion about a sequence of several events or the overall plot/theme of the story. This would include asking the student to put him/herself into the sequence of events or the overall plot and describe the actions he/she would take and why. It requires the learner to evaluate the author or speaker's ability to provide support for conclusions and his/her intent.
- 3.8.4.3. Adequacy and validity judgments: The learner, in this case, is asked to express an opinion about the resemblance or difference between two stories. This could include similarities or differences in the characters (traits, feelings, and variables), actions, or events in each story. This requires the learner to compare the text to related materials in order to express agreement or disagreement.
- 3.8.4.4. Appropriateness judgment: In this event the learner needs to determine which part of the text is most important (e.g. character definition, outcome determination, etc.)
- 3.8.4.5. Worth, desirability, and acceptability judgments: These judgments require the learner to make judgments based on personal experience, morality, value systems, etc.

3.8.5 Appreciation

Appreciation encompasses all the previously-cited cognitive dimensions of reading, for it deals with the psychological and aesthetic bearing of the selection on the reader. It requires the reader to be emotionally and aesthetically sensitive to the work and to make a judgement regarding the worth of its psychological and artistic elements. Appreciation comprises both the knowledge of and the emotional response to literary techniques, forms, styles, and structures.

- 3.8.5.1. Emotional response to the text calls for the learner to articulate feelings of interest, boredom, fear, hate, excitement, etc. It deals with the emotional impact of the entire work on the learner. For instance, a learner may be asked a question like "In the whole story, which part was most fascinating?"

- 3.8.5.2. Identification with characters or incidents: In this instance, learners will be asked questions that will prompt responses that reveal their sympathy for, sensitivity to, and empathy with characters and happenings depicted by the author. For example: “What was your feeling when you came across the sudden death of Thembekile in the story?”
- 3.8.5.3. Reactions to the author's or speaker's connotative and denotative use of language: Here, the learner must to respond to the author or speaker's skilfulness based on the semantic qualities of the selection, viz., connotations and denotations of words. For example: “Why are THEY and THIS capitalised in the following sentence”; “THEY will go together after THIS meeting,” said Khathu.””
- 3.8.5.4. Reactions to imagery: In this case, the learner is required to articulate his feelings with regard to the author or speaker’s capability to use language in a way which causes the learner to envision feeling, taste, smell, or sound. An example of this type of classification is “In which way does the speaker/author let you know that the lady in the next apartment is a widow and needs someone to stay with?”

3.9 Bloom’s Taxonomy

In 1948, Benjamin Bloom, a psychologist by profession, created a taxonomy which is today called “Bloom’s Taxonomy”. He was assisted by several of his colleagues. Bloom’s Taxonomy, originally developed as a method for classifying educational goals for learners’ performance evaluation, has been revised over the years and is still employed in education at this time. The original aim of the taxonomy was to distinguish between three main areas of learning: cognitive, affective, and psychomotor. The cognitive domain incorporates the recognition or recall of knowledge and the development of intellectual abilities and skills; the affective domain comprises changes in values, attitudes, and interest, and the development of appreciations and acceptable adjustment; and the psychomotor domain involves the calculating or motor-skill area. Bloom’s Taxonomy applies only to acquiring knowledge in the cognitive domain, which embraces intellectual skill development, although the developers’ aim was to deal with all three domains.

To avoid confusion, it is important to understand that taxonomy and classification are one and the same. Taxonomy is a model which classifies thinking according to six cognitive levels of complexity. The lowest three levels (called the LOTS) are knowledge, comprehension, and application. The highest three levels (called the HOTS) are analysis, synthesis, and evaluation. Bloom’s taxonomy is hierarchical in that each level is subsumed by

the higher levels.

A learner working at the application level has already grasped the material at the comprehension and knowledge levels. The hierarchy is the indication of how this arrangement leads to the acknowledged divisions of higher and lower levels of thinking. In addition to measurement, Bloom expected that the taxonomy could be used to facilitate communication among educators across both subject matter and education levels. The taxonomy has been generally accepted and used in education and education research, with the original translated into 22 languages¹³⁵.

Teachers can, through the use of Bloom's Taxonomy in the classroom, assess learners according to numerous learning outcomes that are associated with the DBE's district, provincial, and national standards and objectives. The taxonomy can be used in all phases (foundation, intermediate, senior and Further Education and Training (FET)) and content areas. All levels of Bloom's Taxonomy can be achieved through one image because within each level of the taxonomy, numerous tasks move learners through the taxonomy's thought process.

The original Bloom's Taxonomy consisted of six developmental categories, which are: 1) knowledge; 2) comprehension; 3) application; 4) analysis; 5) synthesis and 6) evaluation. One of Bloom's students, Lorin Anderson, revised the original taxonomy in the 1990s. The names of the major cognitive process categories were altered in the revised version of Bloom's Taxonomy to indicate action, since thinking denotes active engagements. Rather than cataloguing knowledge as a fragment of the taxonomy, the category is divided into different types of knowledge: factual, conceptual, procedural, and metacognitive. Anderson's taxonomy also moves the evaluation stage down a level. The highest level becomes "creating".

¹³⁵ Krathwohl, D.R. 2002 pp. 212-218

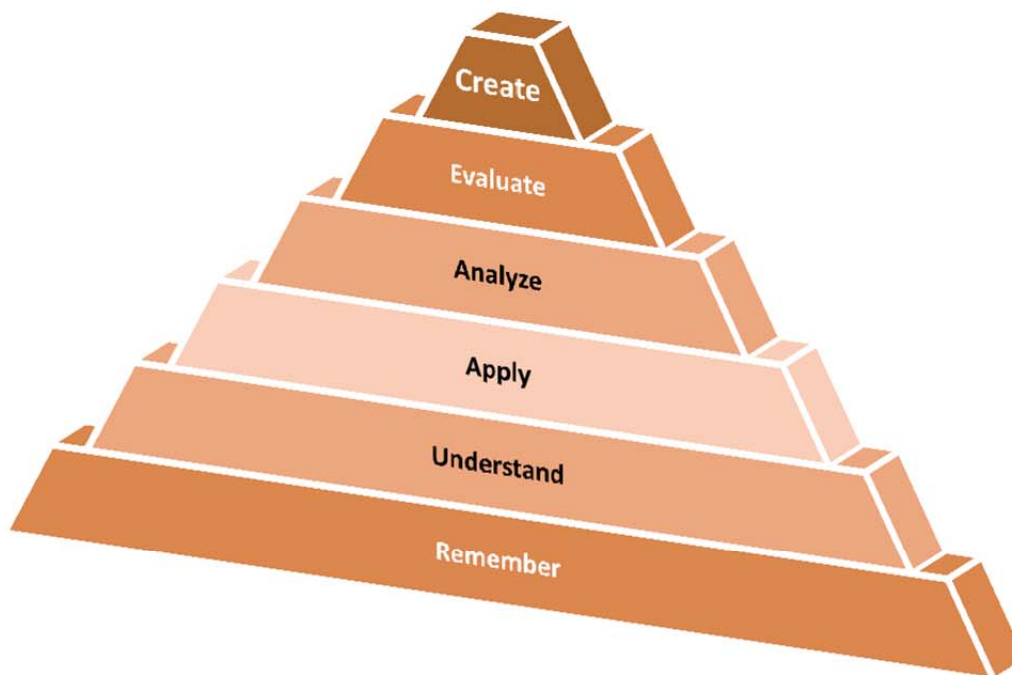


Figure 7 - Bloom's Taxonomy's six developmental categories

The first category concentrates on knowledge acquisition - which has been revised to remember - and it is at this level that learners memorise, list, recall, and repeat information. At the second level, comprehension - which has been revised to understand - learners will identify, classify, describe, explain, and discuss information. At the third level, application - revised to apply - learners must interpret, demonstrate, and write about what they have learned and solve problems. At the fourth level, analysis - revised to analyse - learners need to examine, contrast, distinguish, and compare what they have learned with other information, and they have the opportunity to question and test this knowledge. At the fifth level, evaluate - which was previously called evaluation, and was the sixth in Bloom's Taxonomy's hierarchy - learners debate, defend, support, and evaluate their judgment of this information. Lastly, we have create - which was the fifth level and called "synthesis" in the Bloom's Taxonomy - here, learners will generate new ideas, products, or ways of viewing things. They will be designing, constructing, planning, producing, inventing, etc.

In Bloom's taxonomy, the current study focuses only on the second category, which is comprehension - revised to understand. The reason for this is that it is this category that correlates with the core taxonomy used in this study - i.e. Barrett's taxonomy.

The comprehension category comprises behaviours and learning objectives that represent a rudimentary understanding of a communication that can be either in verbal, written, visual, or emblematic form. The comprehension objective denotes the lowest level of understanding.

With comprehension, a learner must not only have knowledge, but must also understand what he/she knows¹³⁶.

A method in which teachers can check whether learners comprehend the information they have is to have them state that information in their own words as opposed to recalling what they have heard or read. One more approach for teachers to check learners' comprehension is to have them provide an example of the concept being learned. When a learner understands information instead of simply recalling it that information turns out to be useful in future problem-solving or decision-making and makes creativity more realistic. Bloom's Taxonomy divides comprehension into three steps:

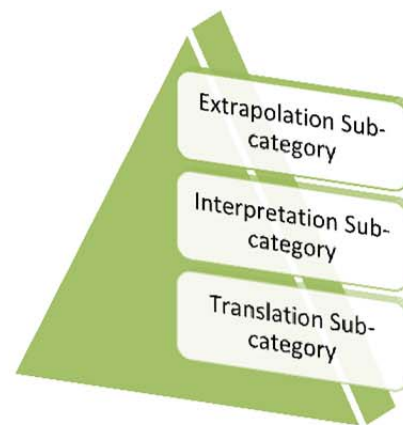
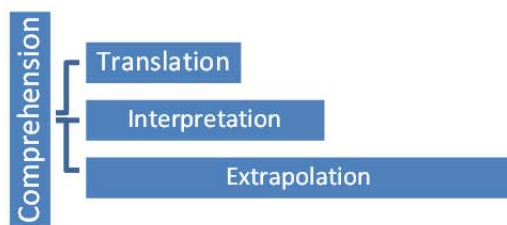


Figure 8; Bloom's three steps of comprehension Figure 9; Bloom's three steps of comprehension

3.9.1. The Translation sub-category

This sub-category takes account of the ability to place a message into another form of communication. It is the ability to use abstract material without losing the meaning of that material. Translation necessitates prior knowledge of the subject matter, so the learner can summarise it into a general idea. It entails intricate tasks such as analysis and application, as well as a simple recall of knowledge. For instance, the ability to translate Tshivenda language into English or the ability to convert a long statement into a briefer form is applications of translation. Translation can be approached by having the learners state the translation ideologies in their own expressions. There could even be a competition to see who comes up with the best alternate statement of the theory or opinion.

¹³⁶ Bloom B.S., 1956

3.9.2. **The Interpretation sub-category**

This sub-category of comprehension encompasses reorganising the presented concepts or material. Learners show their understanding of the material by creating, for example, a diagram of what they have learnt or mind map of what they are about to write. They need to understand the relationships between the presented ideas and be able to identify them. An instance of interpretation is having the ability to understand several types of reading material.

3.9.3. **The Extrapolation sub-category**

Extrapolation refers to the ability to interpret a text beyond the limits the writer has set. This may also mean the ability to envisage possible consequences or developments within the text. For example, a learner might have to observe a picture and predict what might occur in the future. Extrapolation requires the ability to apply ideas to situations and problems not included in the text. Often, this means predicting a possible outcome. With extrapolation, the teacher might explain about a protagonist and an antagonist and ask the learners what they think will happen if a tritagonist is permanently removed from society. Extrapolation is therefore the ability to differentiate value judgements from predictions of consequences, or the ability to predict the consequences of a course of action.

3.10 Conclusion

Smart mobile devices have become tools for education and language learning, and their users (learners or teachers) are exploiting this situation in order to make education as omnipresent as possible.

This chapter makes it evident that comprehension may be considered the most important stage in language learning. With the arrival of the third generation of SPs in the hands of most secondary school learners in both urban and rural areas, it is credible to start thinking of designing a multimedia system for learning reading and listening comprehension with the assistance of these ubiquitous devices.

The advent of SPs will assist in addressing the mounting concern about today's learners' insufficient literacy skills. The device can play an important role in executing different language learning activities, especially comprehension. Because of learners' experience in the use of SP features (audio, video, camera, etc.) this will be executed easily. Learners' confidence towards learning through the use of SPs can be significant in numerous types of

questions that could be asked from them in each category of the taxonomy. Areas of SP language-learning are wide-ranging. Amongst these, the most common are summarising, vocabulary acquisition, listening, grammar, reading comprehension, literature, etc.

With the aid of SPs, there will be a move from teacher-centred learning to learner-centred learning. Although the learning process can hardly be perfect in the absence of a teacher's direction or guidance, SPs will provide this guidance.

Chapter 4

Case Study Design

This chapter deals with the design of the case study and the questions of research methodology that are applicable to the case.

As explained before, this experimental case study wanted to explore the possibilities to improve and accelerate formal learning with the help of SPs. South Africa's education system focused, for some time, on a move towards a learner-centred, flexible approach using a grouping of learning and teaching strategies. The integration of SPs into secondary school education curricula is one such strategy that needs to be taken into consideration.

To probe this further a case study was designed and executed.

4.1 The objectives and context of the case study

In the absence of any reported study of a similar nature in South Africa, the case study reported on in this thesis was of necessity *experimental* in character. It (a case study) was set up in a township school in Gauteng province in South Africa.

The point of departure was the assumption that the universal acceptance of SPs in society in general would make the use of such devices in a teaching environment an almost natural occurrence. Moreover, as SPs and young people seem to be inseparable, using them in a learning curriculum could make the learning content feel more familiar to the learners. Lastly, it was assumed that the use of SPs could trigger cognitive actions of the human brain; something that conventional learning methods do not necessarily do.

From the start, a design limitation was built into the research project. Given the economic environment in developing communities and the relatively high cost of telecoms in South Africa, no functions of SPs were going to be used that would incur communication costs. This effectively excluded the use of the web and of telephony.

Against this background the following objectives for the case study were set:

1. Assessment of the user acceptance of SPs in the context of learning (refer to chapter 1; 1.2.1.1. and 1.2.2.1.)
2. Assessment of the impact of cognitive functions triggered by SPs on the learning process itself (refer to chapter 1; 1.2.1.2. and 1.2.2.2.)
3. Assessment of the impact of use of SPs' multimedia in boosting a higher level of learning than the usual one-dimensional teaching process (refer to chapter 1; 1.2.1.3. and 1.2.2.3.)

After receiving the necessary authorisation from the Gauteng Education Department, the Headmistress of the school and the relevant learners, the researcher (who is also a Grade 12 Tshivenda teacher) initiated the study. The study was, therefore, confined to language studies. The class consisted of 32 learners in Grade 12. Their ages ranged from seventeen to twenty years.

The class received tuition for four and a half hours every week, utilising the allocated language study time on Tuesdays and Thursdays between 14h35 and 16h00. This took place from the 5th February to the 23rd May 2013.

The class was divided into four groups (A, B, C and D), each having eight learners. Later, two groups were each left with seven learners after two learners withdrew from the project, citing an overload of work. They nevertheless benefited from the project as they received invented materials from participating learners.

4.2 Curriculum correlation with smart phone functions

The teaching curriculum of the project followed the Gauteng Education Department's prescribed curriculum for Tshivenda.

The novel aspect of the project was the linkage between the curriculum and selected functions of SPs. The linkup was done on the basis of assumptions about the cognitive characteristics of each SP function and how the triggering of such cognitive dimensions (using SPs) would contribute to enhanced learning.

Consequently, a crucial part of the design of the case study was to develop a framework which extended the basic curriculum to SP-mediated cognitive functions.

Based on the literature analysis, and given the primary role given to Bloom's taxonomy in the South African education context in general and Barrett's taxonomy for languages in

particular, the choice was made to design a conceptual framework for the case study by combining the curriculum with Bloom and Barrett’s taxonomies, and to extrapolate from this to specific functions of SPs.

4.2.1 A schematic framework for the case study

Table 2; Term one and term two activities

Term One Activity	Use of SPs	Learning Sub-type	Learning Type
1. Comprehension Test	Learners viewed a video clip of a Tshivenda song from their SPs and thereafter responded to written questions based on the song. They recorded themselves questioning each other about the clip. The idea was to experiment whether learners are able to recognise and recall, through questioning, events that were taking place in the clip.	1.1 Recognition or Recall of Details	Literal Comprehension
2. Essay	Learners used smart phones to take pictures related to an essay (Bloom’s understanding and applying). Such pictures were placed sequentially, so that they can act as a mind map for learners’ essay writing and assist in recalling.	1.3 Recognition or Recall of a Sequence	
3. Drama analysis	Learners were given a study guide of the prescribed novel in PDF format (compatible to smart phones), which includes key elements of a prescribed drama book.	1.5 Recognition or Recall of Cause and Effect Relationships	
4. Oral (Listening and Speaking)	Learners were informed to use their SPs to record a talk show from Phalaphala FM (Tshivenda SABC radio station). After a listening activity, the teacher provided opportunities for a discussion – which was also recorded (Bloom’s understanding and applying). Learners used the same talk show recordings to formulate their own debates, small	2.1 Classifying and 2.4 Synthesising	Reorganisation

	group discussions, and other structured discussion activities – also recorded.		
5. Language	Learners viewed again a video clip of a Tshivenda song. This time they had to identify three verbs and provide their antonyms, three adjectives, three exclamations, (remembering). Answers were given by creating their own paragraph in a written form, which was then converted to an Adaptive Multi-Rate (AMR) audio format (creating).	2.2 Outlining and 2.4 Synthesising	
6. Summary	Learners took photos of objects or scenes signifying the passage they have read which was then summarised as a photo story and a PowerPoint Presentation (PPT).	2.3 Summarising	
7. Drama analysis	Learners had to analyse, evaluate and reproduce the elements of a drama in an AMR audio format.	2.4 Synthesising	
8. Essay	Gathering photos through SP cameras in order to link ideas and to model relationships of concepts. All learners in a group had to collect photos which are relevant to the essay topic given to them. They displayed to the group the photos they collected with their SPs, and also had to explain their choices and motivations behind the photos encompassed.	3.2 Inferring Main Ideas	Inferential Comprehension
9. Poetry	Learners shared, through SPs' Bluetooth features, the best video-recorded poems to help improve theirs. They had to observe, ask questions, and answer questions while watching those poem clips (analysing, evaluating and creating). Learners also fantasized a great deal when presenting traditional, gospel and rap songs (captured, stored, shared and applied (viewed) through SPs).	4.1 Judgments of Reality or Fantasy	Evaluation
10. Poetry	Learners brought short video clips of them presenting a poem, taking into consideration the	4.4 Judgments of	

	<p>judgments of appropriateness; the way sentences, verse lines, and poems as a whole are presented, the choice of image, rhythm, pace, sound, phrasing, eye contact, facial expressions, gestures, and body language (Bloom's analysis, synthesis and evaluation).</p> <p>The teacher had to let learners share, through blue-tooth, the best video-recorded poems to help improve theirs (analysing, evaluating and creating).</p>	Appropriateness	
11. Drama analysis	Learners reproduced elements of a drama in the form of video clips captured, shared and viewed through SPs. They combined them with other learners' elements to compile an MP4 video study guide. They did all these judging the worth, desirability and acceptability of such elements.	4.5 Judgments of Worth, Desirability and Acceptability	
12. Oral	Learners selected a number of emotive words from a recorded FM speech, or recorded discussion, and incorporated them into a piece of writing - appropriate to the context. A photo of a piece of writing was taken, stored and shared through Bluetooth (analysing, evaluating and creating).	5.1 Emotional Response to the Content	5. Appreciation
13. Poetry	Learners recorded interviews with their parents, grandparents, uncles and/or aunts, discussing and reacting to the poet's use of language. How does this poem differ from the typical definition of a poem? What makes this text a poem if it does not rhyme or talk about elegant things?	5.3 Reactions to the Author's Use of Language.	

Term two Activities	Use of SPs	Learning Sub-type	Learning Type
14. Comprehension	Recorded Tshivenda news bulletin: Learners used their SPs to record the news, listen to the news, and thereafter record themselves suggesting additional facts the news reader might have included which would have made the news more informative and interesting.	3.1 Inferring Supporting Details:	Literal Comprehension
15. Essay	Learners used their SPs' cameras to take pictures of urban and rural areas in support of an argumentative essay. Such pictures were inferring comparisons on environment, occupation, size of community, density of population, social mobility, social interaction, social differentiation, culture, leadership patterns etc.	3.4 Inferring Comparisons:	
16. Novel	All four groups of learners were given, through SP Bluetooth, a PDF file comprising exposition, rising action and conflict of a novel. They studied the three concepts and each group wrote a note predicting the outcome of climax, falling action and denouement. Each group took a photo of its note, and circulated it through Bluetooth to other groups for comparisons. After comparison, the real PDF file of climax, falling action and denouement was distributed.	3.7 Predicting Outcomes:	

17. Oral: Listening for critical analysis and evaluation	Audio/Video clip of an advertisement: Learners used their SPs to record an advertisement which was critically listened to. They recorded themselves making a judgement on whether what the advert proclaims is a fact or opinion; for example, an advertisement might assert that one brand is the best in the world, notwithstanding the lack of concrete evidence to support such a claim.	4.2. Judgments of Fact or Opinion:	Evaluation
18. Summary	Through SPs' Bluetooth feature, learners shared a PDF file of the National Development Plan (NDP) 2030 Overview (Tshivenda version). They studied the introduction of the plan and recorded (MP4) themselves determining whether the plan has substance and is desirable and acceptable. Their recorded judgement was shared with other groups through Bluetooth – which elicited further discussions.	4.5 Judgments of Worth, Desirability and Acceptability	
19. Poetry	Learners were given an SP-compatible slide to study figures of speech. They rewrote a given poem (not rich in terms of imagery), inserting figures of speech where necessary. Thereafter, they transformed a poem into a rap song which was recorded on video.	5.4 Imagery	Appreciation

4.2.2 The linkup between an activity and the specific criterion of Barrett

4.2.2.1. Activity 1: Comprehension Test

Learning type: Literal Comprehension *Learning Sub-type:* Recognition or Recall of Details

There is a linkage between this activity and Barrett's learning sub-type, recognition or recall of details. By watching a comprehension video clip through their SPs, learners can easily recognise and recall events that were taking place in the clip. They can develop expertise in watching a wide range of visual non-literary texts.

Visual literacy has become an important area of literal comprehension study, and the SP screen is a rich source of material. The SP screen rather than the printed page has become the source of most of learners' information, and it is easier for them to recognise and recall details that they have been visually exposed to, than when doing it the traditional way.

4.2.2.2. Activity 2: Essay

Learning type: Literal Comprehension *Learning Sub-type:* Recognition or Recall of a Sequence

In this activity, learners are assigned with a duty of collecting, using their SPs, pictures related to the essay. With pictures it is easier to recognise or recall the sequence of an essay. Using their SPs, it can be interesting for them to select, sort and organise pictures sequentially.

Learners can learn more effectively from words and pictures than from words alone. The combination words and pictures can play a vital role in the recognition and recall of the essay sequence and thus promote understanding. Learners can form an image base from their SP, and organize the images into a pictorial model (a coherent representation).

4.2.2.3. Activity 3: Drama

Learning type: Literal Comprehension *Learning Sub-type:* Recognition or Recall of Cause and Effect Relationships.

With the aid of a PDF study guide of a prescribed drama which learners can read through their SPs, learners in this instance are able to locate, identify and re-produce from memory the reasons for certain incidents, events, or characters' actions explicitly stated in the PDF guide.

It is more effective to receive some notes in PDF format (which is compatible with SPs) than to waste time copying them from a board or to receive manuals which cannot be carried anytime and anywhere. Learners can discover how genre and register reveal the purpose, audience, and context of texts.

They can also recreate incidents, events, or characters' actions explicitly stated in the prescribed drama book, and then store them on the SPs as a PDF or image document.

4.2.2.4. Activity 4: Orals (Listening)

Learning type: Reorganisation *Learning Sub-types:* Classifying and Synthesising

There is a linkup between this activity and Barrett's learning sub-types classifying and synthesising. Learners can formulate and record their own debates, small group discussions,

and other structured discussion activities after listening to a talk show clip recorded, stored and shared through their SPs.

Classifying: in such recorded debates, discussions, etc., learners are able to place people, things, places and events into categories and have the prospect of rewinding the clip.

Synthesising: learners can consolidate explicit ideas or information from more than one source (debates, discussions, etc.). They can record themselves synthesising their work and identifying the best recordings for storage for future use.

Through the use of SPs, learners can classify and synthesise information, construct knowledge, solve problems, and express ideas and opinions.

4.2.2.5. Activity 5: Language

Learning type: Reorganisation *Learning Sub-types:* Outlining and Synthesising

Learners can explain the message from a video or audio clip using different grammatical contents (viewing and hearing). They can enjoy watching or listening to a story unfold before their eyes or ears, rather than reading it without any other kind of sensory input. Synthesising video and audio clips is an activity that can get learners speaking, writing, talking and moving. It also makes them think abstractly and constructively.

Learners can make a meaningful connection with the grammar content they are working with while watching the video clip and then answering questions based on the clip itself. They can divide into pairs, exchange their question notes, and answer their partner's questions. They can re-exchange notes and rate their partner's answers.

Showing video clips without sound and having learners imagine and propose verbs, nouns, qualificatives, locatives, etc. and synthesise time of the day, season etc. from such a soundless clip can be a great language lesson and a lot of fun.

4.2.2.6. Activity 6: Summary

Learning type: Reorganisation *Learning Sub-type:* Summarising

Learners can be given a homework task to condense a selection using pictures. The selection can be summarised through the use of SPs as a photo story and/or a PowerPoint Presentation. By doing this, learners may improve their skills for summarising larger contents into photo stories for presentations.

As learners extract meaning from images and words, they can strengthen their need to further communicate their thoughts. Such an extraction serves as a means for departure toward

higher forms of expression, thus compelling the usage of higher forms of literacy, whilst saving time and resources.

4.2.2.7. Activity 7: Drama analysis

Learning type: Reorganisation *Learning Sub-type:* Synthesising.

Reproducing an analysis of a prescribed book in an audio format can be very rewarding. The benefit of listening to an audio book from their SPs is that learners can focus on the audio while doing other things. They no longer hold the book physically and turn pages, but can listen to the book while doing chores, bathing or relaxing. Another benefit is that audio books occupy much less physical space than traditional books. Although they are not likely to replace traditional books, they do provide an extension of convenience in circumstances where a traditional book would be difficult to enjoy.

Audio books can also be used to improve general literacy. For learners with limited reading skills, listening to audio books will assist them in grasping the meanings of complete sentences and deciphering individual difficult words.

The idea is that we can produce learners who use their skills to develop and present correct visual and multi-media texts for a variety of purposes - Barrett's and Bloom's synthesising (creating).

4.2.2.8. Activity 8: Essay

Learning type: Inferential Comprehension *Learning Sub-type:* Inferring Main Ideas.

Pictures are an ideal source to be used for inference. They make an enormous passage from pictures to text. Learners can infer using pictures to get to the implied meaning of an essay's main idea.

The intention of the experiment is to find out if learners are, through SPs, able to place pictures in a specific order to relay the progression of concepts, emotions, and events. Another interest is that photo mind-mapping can also be applied to their personal plans and long-term goals.

4.2. 2.9. Activity 9: Poetry

Learning type: Evaluation *Learning Sub-type:* Judgments of Reality or Fantasy

Learners' ability to differentiate fantasy from reality has been seriously underestimated because of methodological problems and overgeneralisation from children's performance in situations in which they had no control over the content of the fantasy and/or were presented with misleading information. It is important to keep in mind that there are many types of

fantasy-reality distinctions, and that cultural context plays an important role in the interpretation given to children's activities.

4.2. 2.10. Activity 10: Poetry

Learning type: Evaluation, making judgments *Learning Sub-type:* Judgments of Appropriateness

Through the use of SPs, learners' video clips can reveal both verbal and non-verbal techniques for presentations. They can judge whether such techniques are used appropriately in line with what the poem is saying.

This activity can offer learners the opportunity to create out-of-class recordings in order to demonstrate their proficiency. Through such a process, learners may develop the ability to self-select the recordings they believe best represent their true level of oral proficiency (poem presentation).

Advancement in SP features for individual recordings may provide teachers with the opportunity to collect digital oral production artefacts from learners, while at the same time reducing the amount of class time required for oral assessment.

4.2. 2.11. Activity 11: Drama analysis

Learning type: Evaluation *Learning Sub-type:* Judgments of Worth, Desirability and Acceptability.

Reproducing a drama in an MP4 video format can encourage learners to learn storytelling in more pleasant and interesting ways (worth, desirability and acceptability). Drama is all about interaction, movement, voice, staging etc. It is not only about words and language. How characters interact, what happens when they are not talking and the way bodily expressions are used are indispensable to the meaning conveyed in a play.

4.2. 2.12. Activity 12: Oral

Learning type: Appreciation *Learning Sub-type:* Emotional Response to the Content

Selecting emotive words from an SP-recorded FM speech or recorded discussion and incorporating them into a piece of writing appropriate to the context enhances learning. Learners may judge the emotions expressed by the speech. They can also empathise and sometimes sympathise when selecting such emotive phrases from the speech.

4.2. 2.13. Activity 13: Poetry

Learning type: Appreciation *Learning Sub-type:* Reactions to the Author's Use of Language.

Using SPs to record interviews with people who share the same language and culture can be an amazingly influential resource for a Tshivenda classroom. The use of SP recording devices also enables learners to create, modify, and share audio files. With such recordings, learners have to develop the knowledge of language structures and conventions that will enable them to produce logical and solid texts.

When working with the author's use of figures of speech, it is more important for learners to discuss why such figures have been used rather than to simply identify them.

4.2. 2.14. Activity 14: Comprehension

Learning type: Literal Comprehension *Learning Sub-type:* 3.1 Inferring Supporting Details

Practising news reading may be a difficult task, but through the use of SPs it is a matter of rehearsal and thereafter recording the final news broadcast. SPs assist learners in revisiting the same information or doing the same exercises repeatedly without embarrassment until they are confident.

The skills involved in reporting live news are required from all radio news readers. This skill can be acquired through practice. Learners can use the recording function from their SPs to record their reports and listen to the replay to find out how they reported and what they can improve. It can really be a good experience in inferring supporting details.

4.2. 2.15. Activity 15: Essay

Learning type: Literal Comprehension *Learning Sub-type:* 3.4 Inferring Comparisons

SPs' camera feature affords learners the opportunity to create reasons, construct initiations, draw conclusions and apply them to argumentative essay discussions.

Imagery comparisons support learners' attitudes about various things in urban and rural areas. Reading literature requires skill in making inferences because inferences are based on reasonable assumptions and the interpretation of imagery.

4.2. 2.16. Activity 16: Novel

Learning type: Literal Comprehension *Learning Sub-type:* Predicting Outcomes

The sharing or exchanging of information using SP features can assist learners to gain insight into the prescribed novel and predict outcomes.

The exchange of information through PDF, Bluetooth and camera features plays an important role in preparing learners to predict outcomes.

4.2. 2.17. Activity 17: Oral: Listening for critical analysis and evaluation

Learning type: Evaluation *Learning Sub-type:* 4.2 Judgments of Fact or Opinion

Advertisements can tell consumers about prices and other information that may help them in the decisions they make about what to buy, but they are also biased by sellers to show a product in the best light.

Learners can extract a chain of statements (facts and opinions) from the washing powder advertisement. They can go through each and every statement and determine together whether the statement is a fact or an opinion. After doing several of these and recording themselves using SPs, they can easily identify ways to determine whether a statement is a fact or opinion.

4.2. 2.18. Activity 18: Summary

Learning type: Evaluation *Learning Sub-type:* Judgments of Worth, Desirability and Acceptability

SPs' PDF and video features can play a role in highlighting issues of national importance. Through SPs' Bluetooth feature, learners can share a PDF file of the National Development Plan (NDP). They can study it and record themselves determining whether the plan has substance and is desirable and acceptable. Their recorded judgement can also be shared with other groups through Bluetooth, which can elicit further discussions.

4.2. 2.19. Activity 19: Poetry

Learning type: Appreciation *Learning Sub-type:* Imagery

Imagery in poetry is what the words of a poem make the reader 'see' in their imagination. It is the sounds, colours, and sometimes feelings evoked by the poem. Learners may be given an SP-compatible slide to study figures of speech. After studying this they can rewrite a given poem (which is not rich in terms of imagery) and implant figures of speech where necessary. Next, they can convert a poem into a rap song that is recorded on video. The converted poems can be recorded over their SPs and shared using the SP Bluetooth feature.

4.3. Correlation with Bloom's cognitive dimensions of learning

Bloom's learning taxonomy highlights the different components of the human learning process and its different levels of complexity. The taxonomy is a model which classifies thinking according to six cognitive levels of complexity. LOTS are knowledge, comprehension, and application. HOTS are analysis, synthesis, and evaluation (or, in the revised taxonomy, analysing, evaluating, and creating). As Bloom's taxonomy is hierarchical each level is subsumed by the higher levels. Higher-level learning occurs after lower-level learning has been mastered.

The use of SP features assists participants in mastering the earlier levels in order to succeed with more complex learning objectives. With the aid of their SPs, participants working at the application level had already grasped (also with the support of SPs) the material at the comprehension and knowledge levels. Similarly, when working at the creating level they had already grasped the material at the analysing and evaluating levels.

Participants are able to:

- 4.2.3.1. Remember (recall) facts, patterns, settings, and methods previously learned from their SPs' audio and video clips, photos (images), PDF and PPT files (refer to 4.2.2.1.)
- 4.2.3.2. Understand what is being communicated by grasping the meaning of information from their SPs.
- 4.2.3.3. Apply knowledge to actual situations by using information previously learned from their SPs in new and concrete situations to solve problems (again, with the aid of their SPs) that have one or numerous answers (refer to 4.2.2.4 - 4.2.2.7)
- 4.2.3.4. Analyse (break down) informational materials into their component parts with their SPs so that the ladder of ideas is clear and they can see how the parts relate and are organised (e.g. using their SPs to take pictures of urban and rural areas in support of an argumentative essay (refer to 4.2.2.8. and 4.2.2.15.))
- 4.2.3.5. Evaluate, with the aid of SP features, the value of material based on internal evidence or external criteria. Through SPs' Bluetooth feature, participants shared a PDF file of the National NDP 2030 Overview - Tshivenda version. They studied the introduction of the plan and recorded themselves, with their video recorders, determining whether the plan has substance and is desirable and acceptable (refer to 4.2.2.9 - 4.2.2.11 and, 4.2.2.17 and 4.2.2.18).
- 4.2.3.6. Create (synthesise) by putting together elements and parts or re-arranging component ideas into a new whole. Participants used their SPs to record and listen to the news and thereafter recorded themselves suggesting additional facts the newsreader might have included which would have made the news more informative and interesting. They then used their SPs' audio recording feature to record themselves re-reading the news with the inclusion of previously excluded additional facts (refer to 4.2.2.13 and 4.2.2.19).

4.4 Methodological considerations

An experimental project like the one discussed here demands a strategy to assess the project

during its life and after its conclusion.

Consequently, a number of assessment activities were lined up before the experiment started. In essence all the assessments are subjective and of a qualitative nature.

There was also the danger of extreme bias on the side of the researcher – being not only the controller of the study, but also, as a teacher, an integral part of it.

Against this background the following methodological considerations governed the evaluation of the project.

Qualitative methods of data collection play a vital part in impact evaluation by providing information valuable in understanding the processes behind observed results and assessing changes in people's perceptions. While quantitative research is good at taking a broad view on large groups, qualitative research is concerned with the many deep layers of detail about a small group.

The design of qualitative research may be intricate based on the level of experience a researcher may have with a particular type of methodology. The researcher, in this project, opted for a multiple methodological approach. This approach is discussed below.

4.3.1. Interviews

An interview is a method that orally asks quantitative or qualitative questions of main participants. Quantitative questions are closed-ended and have specific answers to choose between that can be categorized and numerically analysed. Qualitative questions are open-ended; that is, the respondent provides a response in his or her own words. Interviews conducted for program evaluation are typically qualitative but may also include some quantitative questions. The latter will not be applied in this study.

Interviews are particularly useful for getting the story behind a participant's experiences. They are a tool that is regularly used to access people's experiences and their inner perceptions, attitudes, and feelings of reality. The interviewer can use them to pursue in-depth information about the topic. Interviews may be useful as a follow-up to certain respondents to questionnaires, e.g., to further investigate their responses¹³⁷.

Interviews are the basis of case study evaluation. Evaluation of this nature seldom takes place without interviews but is often without focus groups, documents, and observations. Interviews facilitate an understanding both of what took place from the perspicacity of those

¹³⁷ McNamara, C., 1999

involved and how they acted in response to it. They are a generally used instrument that will be used in this project to access learners' experiences of learning and the use of SPs and their inner insights, approaches, and feelings of practicality.

There are several interview design forms that can be developed to find data by means of a qualitative investigational perspective¹³⁸. Qualitative interviews have been categorised in a variety of ways, with many present-day texts loosely categorising qualitative interviews as unstructured, semi-structured and structured. Fontana & Frey¹³⁹, based on the degree of structuring, concur with the division into three categories. This study will focus on the semi-structured format because structured interviews often produce quantitative data. These two types of interview (unstructured and semi-structured) are sometimes interweaved whenever researchers use the term "qualitative interview".

A structured interview, which will not be employed in this study, is an interview that has a set of pre-defined questions. The questions would be asked in the same order for all respondents. They are the most structured and comprise a set protocol of questions and inspections. The interviewer is not permitted flexibility in the wording or order. The standardised open-ended interview is used to curtail the effects of the instrument and the interviewer on the research results. Although administered orally rather than in writing, structured interviews are not dissimilar to surveys. They are thus less important in this study as it seeks to cover both a realistic and a substantive level¹⁴⁰.

Unstructured interviews (also called informal conversational interviews) are the least structured. The wording of the questions and topics to be discussed are not predetermined. These types of interviews often occur spontaneously, and due to the fact that every interviewee is asked a different series of questions, this style can lack the reliability and accuracy of a structured interview. Unstructured interviews are also called non-directive interviews. This study will not rely on these types of interview because the researcher will not benefit a great deal from them as he will not be discussing with Tshivenda Grade 12 participants without direction. James Nathan Miller¹⁴¹ once said "There is no such thing as a worthless conversation, provided you know what to listen for. And questions are the breath of life for a conversation."

¹³⁸ Creswell, J. W. 2007.

¹³⁹ Fontana, A., & Frey, J.H., 2005. 695-728.

¹⁴⁰ Kvale, S. 1996

¹⁴¹ Miller, J.N. 1965, Sept. Reader's Digest, 127.

The Semi-Structured Phase of the Interview

The study involved semi-structured (moderately scheduled) interviews, the most beneficial interview format for conducting qualitative research. Such interviews require a framework of issues or topics to be covered, but the interviewer is free to alter the wording and order of the questions. They are qualitative methods of inquiry that combine pre-determined sets of open questions that prompt discussion, with the opportunity for interviewers to explore particular themes or responses further. This kind of interview is not highly structured, nor is it unstructured. In such an interview, a set of prepared questions acted as a guide for the researcher¹⁴². Though the researcher worked to ensure that certain key questions are asked of every person interviewed, the semi-structured format also allowed and encouraged the researcher to interject with further questions as needed. Topics and questions were given to the interviewee, and were carefully designed to stimulate the interviewee's ideas and opinions on the topic of interest, as opposed to leading the interviewee toward predetermined choices.

This type of interview depended on the interviewer's follow-up with probes to get in-depth information on topics of interest. The interviewer also used some suggestions made by Zorn for designing such interviews.

An overview of the purpose and intended use for the interview data was provided. This was a reminder of the information the researcher gave learners at the beginning of the study's experiments in February 2013. The researcher discussed with respondents and obtained permission to record interviews using an SP audio-recording feature. Measures to protect their anonymity and the confidentiality of the interview were undertaken.

Although it was only semi-structured, the interview was carefully planned. Topics and questions asked were written down and arranged according to the four SP features (video, audio, camera and PDF/PPT) that the study regarded as useful for language learning.

The researcher established a comfortable, relaxed atmosphere and also took into consideration his nonverbal communication. He was well-prepared. He avoided the temptation of leading in his questioning. When a probe was used, the researcher indicated that in his question guide¹⁴³. Probes such as "Mmm" and "Anything else?" were carefully used to get more in-depth answers and to follow up on points of interest. Most of the time, the

¹⁴² Taylor, S. J., & Bogdan, R. 1998

¹⁴³ Zickmund, W. G., 2003 Exploring Marketing Research,

researcher's silence played a vital role in encouraging respondents to continue.

At the end of interview, the researcher asked respondents if he could contact them later in the event that he has extra questions. He was welcomed to do so by all respondents.

After the interview, the researcher took time inspecting the SP-recorded audio clip to see if he had recorded the whole interview. In this case, the researcher played it safe by recording these interviews using two SPs.

4.3.2 Observation

Observation is the strategic and premeditated viewing and analysis of learners' behaviours and skills, their learning environment, and their interactions with other learners and their teachers. Observation presents an opportunity to understand how learners resolve problems and to learn what factors may affect their aptitude to learn, work, and co-operate in a positive way with others.

As this project takes its point of departure from the premise that SPs are ideal computational devices to support and enhance Thomas Barrett and Benjamin Bloom's taxonomies of learning, data concerning the two taxonomies cannot be directly collected from learners. It is the researcher's responsibility to collect it through observation.

Observation is another method that was used in this study to collect data for evaluation. Data were gathered by scrutinizing learners' proceedings and performances in term of literal comprehension, re-organisation, inferential comprehension, evaluation, and appreciation. This also included Bloom's cognitive dimensions of learning.

Data collection by observations was conducted on events (the extent in which joint and individual work took place when learners were using their SPs to carry out their activities), on truths (the manner in which they dealt with their activities based on Barrett and Bloom's taxonomies), and on learners' behaviours (whether they were showing interest or feeling bored). The kind of observations also looked at verbal and non-verbal behaviours of learners.

Observations can also be either direct or indirect. In this study both direct and indirect observations were applied. Direct observation was applied when the researcher was inspecting collaborations, processes, and behaviours as they were occurring - for example, do learners doing their comprehension test comply with Barrett's recognition or recall of details? Indirect observations were applied when the researcher was inspecting the results of interactions, processes, or behaviours; for example, measuring the levels of performance on

an observation sheet for each group.

The researcher relied on covert observation. Unlike overt observation where learners would have known that they were being observed, covert observation gave them the opportunity to behave naturally as they did not know that they were being observed. Nevertheless, the researcher took into consideration the ethical problems involved in covert observation, realising that by applying this type of observation he will not be exploiting learners for his own benefit.

4.3.3 Survey

A survey is a research method used by social scientists to methodically and empirically study and provide information about people and social phenomena. It can be used to find out the sentiments, attitudes, and performances of persons who are contacted to participate in the survey and to obtain other truthful information about members of a population.

In this study a survey was used to find out whether comprehension learning was enhanced by incorporating SP technology into instructional design. Twenty-five participants took part in the survey, and it yielded the anticipated results.

4.5 The organisation and analysis of the data

As the project unfolded a large number of visual and audio artefacts were generated by the learners. In addition there were group performances, discussions and other activities that could not be recorded but form part of the data on which the conclusions to the project are based.

What made this different from conventional records of learning is that none of these were text-based. As can be seen in the next chapter, they can be represented using photos or audio files (MP4s), but they cannot be represented in the conventional prose format.

A strategy to organise, store and analyse such data was developed before the project started. It was also necessary to reflect on how such data were going to be analysed in order to be able to evaluate the learning that they represent.

The methods used comprised transcription, data organising, familiarisation, coding, and record keeping.

4.4.1 Transcription

As many, if not all, qualitative research studies encompass some use of transcription; this study transcribed its data from SP audio-recorded interviews, SP video recordings, and

handwritten ticks on observation sheets. The researcher also included some non-verbal behaviour like the participant's pausing to think, responding with joy that may indicate impassiveness, and silence that may indicate the participant's distress. Other aspects that were taken into consideration when transcribing were gestures, laughter and words such as "After all.... Wow! What if" They were not ignored as they are important features in a discussion or interview.

4.4.2 Data organising

The researcher identified each set of data as it was generated. Items like audio clips, video clips, interview transcripts, observation documents, photographs, and any other source materials were given an identification code that made them readily salvageable. Such material is also coded with a date and context indication. A folder in the researcher's laptop was created with a thorough list of data sources that were compiled and used for reference throughout the analysis. In that folder, each interviewee was given an alias (and not referred to by a code number as this was given to other above-mentioned source material).

For security reasons, an Excel file was created that associates aliases and code numbers to the original informants, and it has been borne in mind that such a file is confidential and would be deleted after completion of the project - predictably after December 2013.

4.4.3 Familiarisation

The researcher, after organising the data, had ample time to listen to audio clips, watch video material and review Barrett's and Bloom's observation sheets. This became an important step, even though the researcher is the one who gathered all the data by himself.

4.4.4 Coding

After familiarisation with the material, the next step is to do some preliminary coding. A qualitative inquiry code is a word or short phrase that symbolically assigns an essence-capturing, cumulative, noticeable, and/or suggestive feature for a portion of visual or language-based data. The data acquired in this study included interview transcripts, researcher's observations, documents, video, audio, and photographs. There are other areas that codes can be retrieved from but these were not applied in this study. They are participant observation, field notes, journals, literature, e-mail correspondence, websites, artefacts, and so on.

During the first cycle of coding processes the portion of data that was coded varied in scale

from a single word to a full sentence. In second cycle coding processes, a reconfiguration of the codes and longer passages of text was carried out.

4.4.5 Record-keeping

A record of the researcher's thoughts and theories has been kept. Some examples of verbatim data that support the researcher's argument have been included. This saved time when searching for data at a later stage, and guaranteed that the researcher's analysis was grounded in real evidence. Tables and other audio and visual means to support analysis were safely kept.

Qualitative research is an interpretative and subjective exercise, and the researcher is intimately involved in the process¹⁴⁴. For data analysis in this study, words had to be combined into meanings and meanings had to be organised, elucidations had to be considered, and conclusions were then reached.

Qualitative data analysis for this study is concerned with the qualities exhibited by data more than with their quantities. Therefore, qualitative data analysis is considered to be a far more thought-provoking and resourceful undertaking than quantitative data analysis.

4.5 Reliability and validity

Reliability and validity are important issues in all research, including qualitative research. This study is qualitative and wants to signify that its qualitative data analysis is demanding, given a shared disapproval - from those who are not approving qualitative research - that qualitative results are unreliable.

4.5.1 Reliability

Reliability was ensured by the researcher describing and interpreting his experimental experiences and also by allowing participants to read and discuss the research findings¹⁴⁵. Credibility may also be confirmed by observation and lengthy rendezvous.

The emphasis when evaluating this qualitative research was placed on the reliability of the methods involved. The researcher had to make sure that the methods he employed were reproducible and consistent. He confirmed the reliability of his analysis by, amongst others, documenting the process of fashioning themes, concepts or theories from the data audit trail, relating the approach to and processes involved in data analysis, qualifying why these fit

¹⁴⁴ Pope C, Mays N. 1996

¹⁴⁵ Koch, T. 2006 Volume 53, Issue 1, pages 91–100, January

within the framework of the study, and referring to other attestations, including earlier studies, to support the conclusions drawn from his analysis.

4.5.2 Validity

Here the emphasis is on the validity of the findings. Validity, in qualitative research, refers to whether the findings of a study are true and certain - true in the sense that the research findings truthfully mirror the situation, and certain in the sense that the research findings are strengthened by the evidence. The findings of this study are true and are supported by evidence.

4.5.3 Triangulation

The researcher of this study has undertaken triangulation in order to demonstrate rigour. Triangulation means gathering and analysing data from more than one source to gain a fuller perspective on the situation the researcher is investigating. The researcher demonstrated rigour by gathering and analysing data from semi-structured interviews and the researcher's observation.

The objective of triangulation is to achieve consistency across data sources or approaches. This is not always the case because inconsistencies may be given the qualified strengths of varied approaches. In Patton's view¹⁴⁶, such inconsistencies should not be seen as weakening the evidence, but should be viewed as an opportunity to unearth immeasurable meaning in the data.

4.6 Ethical Issues in qualitative Interviewing

Participants fully understood what it means to participate in qualitative interviews in terms of risks and benefits. There were no difficulties encountered in terms of cultural differences and language barriers because participants were Tshivenda home language learners who share the same culture and language. It was the duty of the researcher to make certain that participants understood their rights, especially the right to not participate or to withdraw from the research at any time. This was the reason that two female learners opted to withdraw from the experiment, citing a work overload. The two benefited from the project because they were given whatever material emanated from the experiments.

The researcher assured participants that their identities would not be revealed to the reader

¹⁴⁶ Patton, M.Q. 2002.

and the raw data collected would not be released to any third party¹⁴⁷. They did not agree with this, arguing that it is a privilege to be invited to participate in a project and, therefore, their identities should be published if possible. One participant highlighted the fact that after the researcher's explanation of the project, he understands that there is nothing sensitive to be revealed - the project is a continuation of teaching and learning and, therefore, there is no need to hide their identity. The researcher concurred with her.

4.7 Limitations of the empirical study

The limitations of a study are those characteristics of design or methodology that impacted or influenced the application or interpretation of the results of a study. The researcher believes that there are two limitations that might have influenced this study

4.7.1 Sample size

The number of the participants used by the researcher for analysis in his study was dictated by the type of research problem he was investigating. This led to a sample size that was too small - eight were questioned individually and another eight from four groups (two from each group). It was difficult to find significant patterns from the data, but this did not matter much as this was not for statistical tests that generally involve a larger sample size to warrant a representative distribution of a population.

4.7.2 Self-reported data

The researcher of this qualitative research study gathered the data himself. Self-reported data was limited by the fact that it can rarely be independently verified. The researcher had to take what people said in interviews at face value, just as it happens in focus groups or on questionnaires. Two potential sources of bias that were noted as limitations are (a) attribution (ascribing positive events and outcomes to one's own action but accrediting negative events and outcomes to external forces); and (b) telescoping (remembering events that happened at one time as if they happened at another time).

The other two sources, namely selective memory (remembering or not remembering experiences or events that occurred at some point in the past) and exaggeration (representing outcomes or exaggerating events as more significant than is actually suggested from other data) were not noted as limitations.

¹⁴⁷ Parahoo K (2006)

As promised at the beginning of the project, there was no intrusion in personal affairs of learners. At no stage did learners use internet-based systems because all features used were applied offline. No costs were incurred throughout the project. All activities took place within the framework of the prescribed curriculum.

4.7.3 Confined to language studies

The functions of SPs that were used in this project all support speech, audio and visualisation. These are cognitive functions that underpin all language. Using such functions naturally enhances any language activities.

Using SPs for other disciplines, such as Mathematics or Bookkeeping will not necessarily find such functions useful.

4.7.4 Single case experiment

It must be granted that complete validation of the results of this case study can only be done after similar studies have been completed in other educational settings. The success that was observed in this case may depend on localised and personal factors that are not observable. It would also have been ideal to repeat the experiment with the same class in the second semester. Some of the learners' enthusiasm could be ascribed to novelty. How would students cooperate once using SPs as a learning tool becomes standard? However, conditions do not allow for such a follow-up, and the best that can be done is to maintain some healthy scepticism about the generalizability of the use of SPs in teaching and learning.

4.7.5 No communication functions

For reasons explained above, there was an explicit choice to exclude any use of SPs that may generate running costs. This excludes the possibility of utilising the communication function of the devices. Probably the most negative impact thereof is the fact that collaborative work on documentation such as compilation, editing and discussion becomes impossible.

Chapter 5

The Flow of the Experiment

In this chapter the experiment will be discussed in the sequence in which it unfolded. The flow of events is categorised according to the cognitive criteria as developed in the framework described in the chapter.

The 31 learners were divided into four groups (A, B, C and D); three consisting of eight learners, and one of seven. They were assigned different activities at different times, though there are some activities that were done by all groups at the same time. All these activities were done after school during learners' study time.

5.1 Term One

The experiment during the first term lasted for seven weeks. Some activities were concurrently conducted by different groups in the same week. Learners were engaged in the following learning types using their SPs:

5.1.1 Literal comprehension

For background to this section refer to chapter 4; 4.2.2.1 - 4.2.2.3

We used weeks one and two to concentrate on Barrett's first level of learning types – literal comprehension. Groups C and A were engaged in the first week for Recognition or Recall of Details and Recognition or Recall of a Sequence, respectively.

Group C learners viewed a video clip of a Tshivenda song from their SPs and thereafter responded to written questions based on the song. They recorded themselves questioning each other about the clip. The idea was to determine whether learners are able to recognise and recall details through questioning of events that were taking place in the clip.

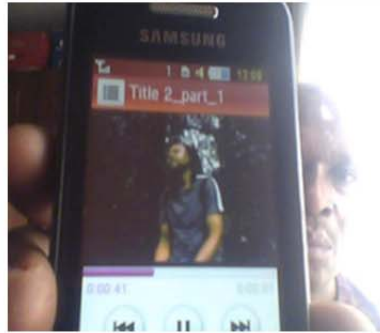


Figure 10; Tshivenda song video clip

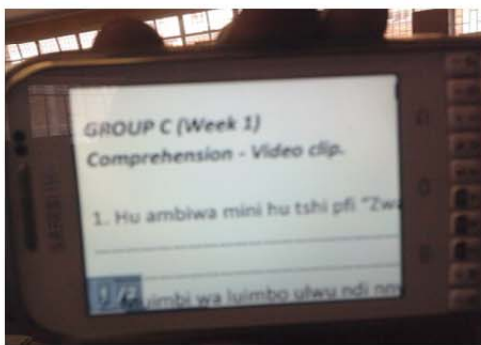


Figure 11; Written questions based on the song



Figure 12; Audio recording of questioning each other

Learners in group A used SPs to take pictures related to an essay. They had to select, sort and place such pictures sequentially so that they could act as a mind map technique to assist learners in recalling for an essay writing activity. They had to form an image base from their SPs and organize the images into a coherent representation (a pictorial model).

Learners were learning more effectively from words and pictures than from words alone. The combination of the two (words and pictures) is vital in promoting understanding. This also depicted Bloom's LOTS – remembering, understanding and applying.

They also used their built-in camera feature as a scanner to capture notes from the board and important pages from the book.

During the second week all four groups (A, B, C and D) concentrated on recognition or recall of cause and effect relationships. Learners were given a study guide of the prescribed novel in PDF format (compatible with SPs), which includes key elements of a prescribed drama. They perused their study guides through their SPs and had to split into groups to deal with key elements of the book.

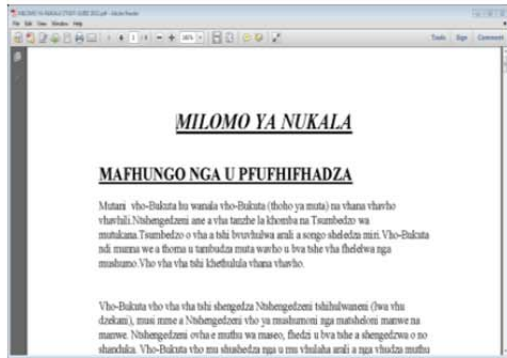


Figure 13; Prescribed novel study guide in PDF format

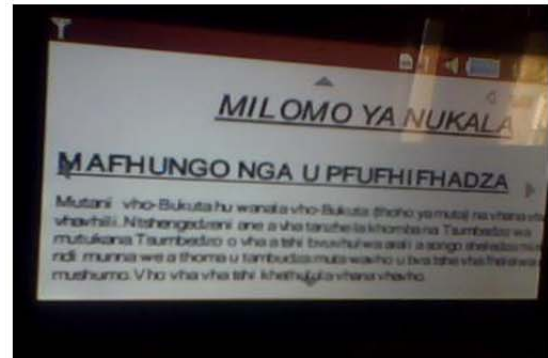


Figure 14; Perusal of the study guide through their SPs

Learners used their SPs to recognise how genre and register reflect the purpose, audience, and context of texts. They also organized their notes and images and, with the assistance of three laptops we had, created notebooks of documents which they stored on their SP devices as a PDF or image file.

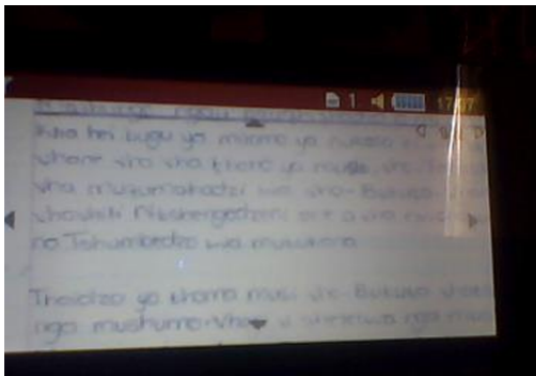


Figure 15; Perusal of notes through their SPs

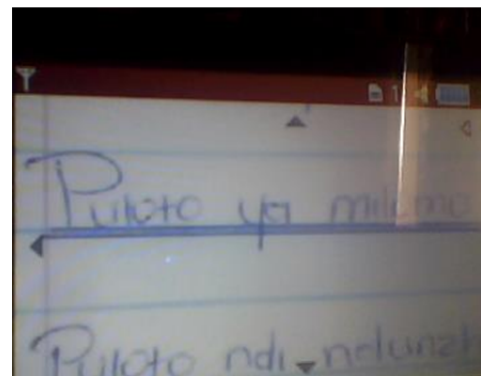


Figure 16; Hand-written notes in PDF format

5.1.2 Reorganisation

For background to this section refer to chapter 4; 4.2.2.4 - 4.2.2.7

The second level of Barrett taxonomy's was dealt with during the third and fourth weeks of the experiment. All four groups were involved in this type of learning.

During the third week Group B dealt with classifying and synthesising sub-types. Learners were informed to use their SPs to record a talk show from Phalaphala FM (a Tshivenda SABC radio station). After a listening activity, the teacher provided opportunities for a discussion which was also recorded (Bloom's understanding and applying). Learners used the same talk show recordings to formulate their own debates, small group discussions, and other structured discussion activities which were also recorded (Bloom's synthesis (creating)).



Figure 17; A recorded talk show from Phalaphala FM

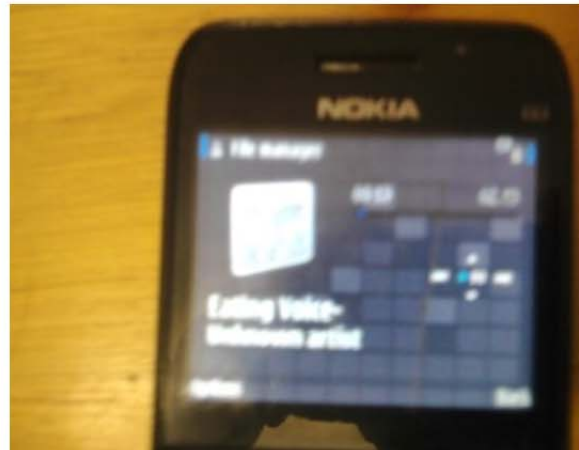


Figure 18; SP audio play of a recorded talk show

Group D, in the same week, concentrated on outlining and synthesising. Learners in this group viewed the same video clip of a Tshivenda song. This time they had to identify three verbs and provide their antonyms, three adjectives and three exclamations, (remembering). Answers were given in the form of learners' own written passages which include the aforementioned parts of speech. This was later converted to an Adaptive Multi-Rate (AMR) audio format (creating).

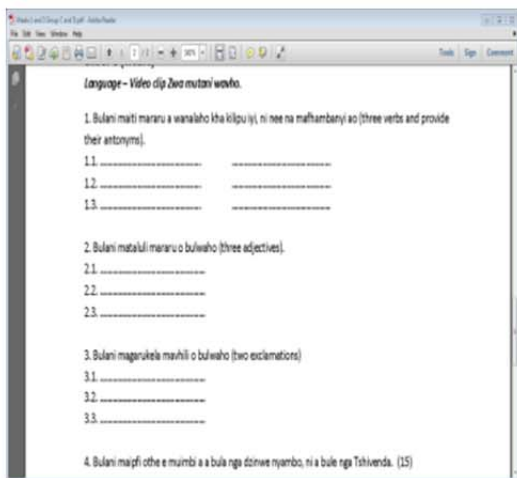


Figure 19; Written grammar questions based on the video song clip



Figure 20; Grammar questions

After watching a clip, they also devised questions based on grammar. Thereafter, they divided into pairs, exchanged their papers, and answered their partner's questions. Learners then exchanged papers again and rated their partner's answers.

They also had to retell the message from a video clip using different parts of speech. This strategy gets them speaking, writing, talking and moving.

In the fourth week, the learning sub-type summarising involved Group C learners. They took photos of objects or scenes relating to the passage they had read which was then summarised

as a photo story and a PowerPoint Presentation (PPT) compatible with their SPs.

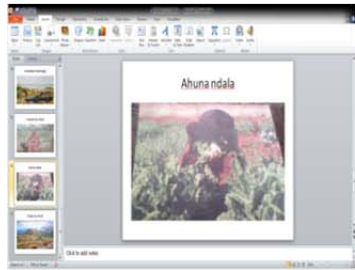


Figure 21; Passage photo scenes Figure 22; PPT photo story Figure 23; SP display of a photo story

By collecting and arranging photos according to the passage they had read, learners had to explain about their pictures in further detail. They also viewed photos and engaged in talk that was relevant and inquiry-based in order to clarify and summarise their understanding of both their own photo-stories and the stories of their group members.

The four groups (A, B, C & D) came together to synthesise their prescribed drama book. They analysed, evaluated and reproduced the elements of a drama in an AMR audio format.



Figure 24; Learners synthesising their drama book Figure 25; Listening to a drama in an AMR audio format

5.1.3 Inferential Comprehension

For background to this section refer to chapter 4; 4.2.2.8

Inferring Main Ideas is the only subtype chosen from the inferential comprehension learning type and was tested by Group D in the fifth week.

Photos were gathered through SP cameras in order to link ideas and to model relationships between concepts. All learners in a group had to collect photos which were relevant to the essay topic given to them. They displayed to the group the photos they collected with their SPs, and also had to explain their motivations for selecting the chosen photos. The group had to transfer the most relevant photos to one of the three laptops so that the essay photo mind map could be visible when it was discussed with the class. After discussions, a photo mind map was saved in PDF format, which was then transferred back to their SPs.



Figure 26; Essay mind map photos



Figure 27; SP display of essay mind map photos

Since pictures are an ideal source for inference, they make an enormous path from pictures to text. Learners inferred by using pictures to get to an essay's main idea.

5.1.4 Evaluation

For background to this section refer to chapter 4; 4.2.2.9 - 4.2.2.11

Group B focused, during the fifth week, on judgments of reality or fantasy. The teacher let learners share, through Bluetooth features, the best video-recorded poems to help improve theirs. They had to observe, ask questions, and answer questions while watching those poem clips (analysing, evaluating and creating).

In the same week (week five), Group A concentrated on judgments of appropriateness. Learners brought short video clips of themselves presenting a poem taking into consideration the judgments of appropriateness; for example, the way sentences, verse lines, and poems as a whole are presented; the choice of image, rhythm, pace, sound, phrasing, eye contact, facial expressions, gestures, and body language (Bloom's analysis, synthesis and evaluation).



Figure 28; Poem presentation video clip 1



Figure 29; Poem presentation video clip 2

They had to judge whether both verbal and non-verbal techniques for presentations were used appropriately in line with what the poem is saying. By carrying out such a process, learners had the ability to self-select the recordings they believed best represented their true level of oral proficiency (poem presentation).

During the sixth week, Groups A, B, C & D converged to continue analysing the prescribed drama through judgments of worth, desirability and acceptability. They combined elements of a drama, reproduced during the fourth week, with other learners' elements to compile an MP4 video study guide. This allowed learners to develop the ability to retell a story making use of various techniques (analysing, evaluating and creating).



Figure 30; Reproduced drama as an MP4 video study guide. Figure 31; MP4 video study guide (Cont.)

5.1.5 Appreciation

For background to this section refer to chapter 4; 4.2.2.12 - 4.2.2.13

During the course of week six, Group C commenced with the last level of Barrett's learning types, focusing on emotional response to the content. Learners selected a number of emotive words from an SP-recorded FM radio speech or recorded discussion, and incorporated them into a piece of writing appropriate to the context. A photo of the piece of writing was taken, stored and shared through Bluetooth (analysing, evaluating and creating).

They also judged emotions expressed by the speech, empathising and sometimes sympathising when selecting such emotive phrases.

The last week - week seven - of the first term involved Group D learners, who focused on *reactions to the author's use of language*. Learners brought audio-recorded interviews with their parents, grandparents, uncles and/or aunts, discussing and reacting to a poet's use of language. Questions asked were; 'How does this poem differ from the typical definition of a

poem?’ ‘What makes this text a poem if it does not rhyme or talk about elegant things?’

Learners and their relatives also discussed why such figures of speech had been used rather than simply identifying them.

5.2 Term Two

During the second term a repeat of six sub-types of three learning types activities were conducted.

5.2.1 Literal comprehension

For background to this section refer to 4.2.2.14 - 4.2.2.16

The eighth week engaged group A in *Inferring supporting details* through their SPs.

Learners used their SPs to record the Tshivenda news bulletin, listen to the news, and thereafter record themselves suggesting additional facts the newsreader might have included which would have made the news more informative and interesting.



Figure 32; Learners listening to Tshivenda news

They had to record the news from Phalaphala FM, write down notes (not a script) and then try to deliver the news as efficiently as possible. Although they were sounded as though they were ad-libbing, their reports became accurate. They used the recording function from their SPs to record their reports and listen to the replay to find out how they reported and what they could improve.

The ninth week involved Group C learners *inferring comparisons* with the aid of their SPs. They used their SPs' cameras to take pictures of urban and rural areas in support of an

argumentative essay. Such pictures were inferring comparisons on environment, occupation, size of community, density of population, social mobility, social interaction, social differentiation, culture, leadership patterns, and so forth.

With their SPs' camera feature, learners created reasons, constructed initiations, drew conclusions, and applied them to the argumentative essay discussions.

The tenth week again brought all groups (A, B, C & D) together to deal with the predicting outcomes sub-type.

Learners were (using SP Bluetooth) given a PDF file comprising the exposition, rising action and conflict of a novel. They studied the three concepts and each group wrote a note predicting the outcome of climax, falling action and denouement. Each group took a photo of its note, and circulated it through Bluetooth to other groups for comparisons. After comparison, the real PDF file of climax, falling action and denouement was distributed.

5.2.2 Evaluation

For background to this section refer to 4.2.2.17 & 4.2.2.18

Group D, in the eleventh week, focused on judgments of fact or opinion through listening for critical analysis and evaluation. Audio clips of advertisements were used.

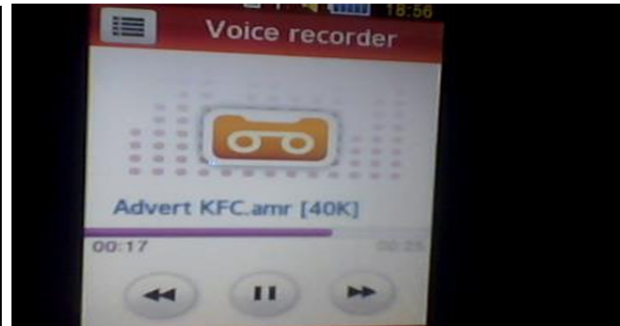
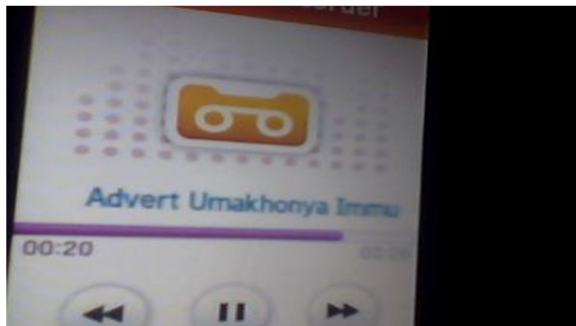


Figure 33; Audio advertisement clip 1 (Umakhonya)

Figure 34; Audio advertisement clip 2 (KFC)

Learners used their SPs to record advertisements which were critically listened to. They recorded themselves judging whether what the advertisement proclaims is a fact or opinion; for example, an advertisement might assert that one brand is the best in the world despite the lack of concrete evidence to support such a claim. They also took into consideration the fact that advertisements can tell consumers about prices and other information that may help them in the decisions they make about what to buy, but they are also biased by sellers to show a product in the best light possible.

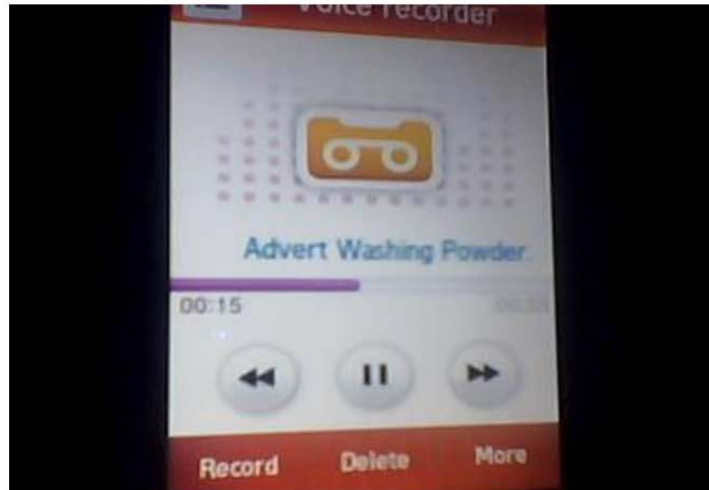


Figure 35; Audio advertisement clip 3 (Washing Powder)

Learners had a lengthy discussion about a well-known washing powder advertisement. They indicated that factual claims in the advertisement should be supported with evidence in order to protect consumers and make sure that competition among sellers is fair. Others refuted the idea, saying that it is acceptable for sellers to talk only about the positives and ignore the negatives of what they are selling, and that it is up to the consumers to separate factual claims from opinions and exaggerations. Their discussion was video recorded with their SPs.



Figure 36; Discussion about a washing powder advert. Figure 37; Discussion about a washing powder advert (Cont.)

Learners were able to show a chain of statements - facts and opinions - from the washing powder advertisement. They went through each and every statement and determined together whether the statement is a fact or an opinion. After doing several of these, I could see that through SP recordings they can easily identify ways to determine whether a statement is a fact or opinion.

The twelfth week involved group B learners who were testing judgments of worth, desirability and acceptability sub-type with the aid of their SPs.

Through SPs' Bluetooth feature, learners shared a PDF file of the National Development Plan (NDP) 2030 Overview (Tshivenda version). They studied the introduction of the plan and recorded (MP4) themselves determining whether the plan has substance and desirable and acceptable. Their recorded judgement was shared with other groups through Bluetooth, which elicited further discussions.

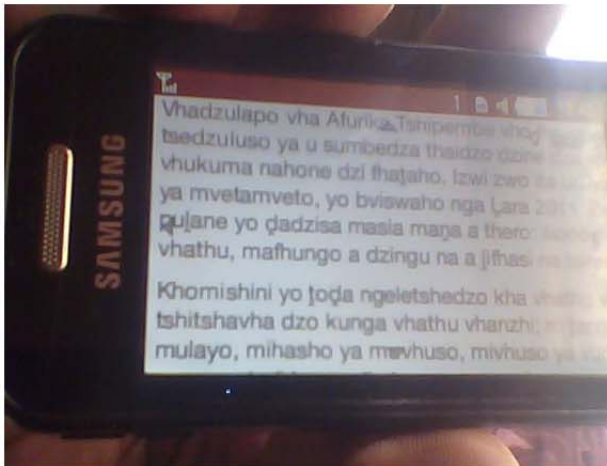


Figure 38; PDF file of the NDP 2030 Overview

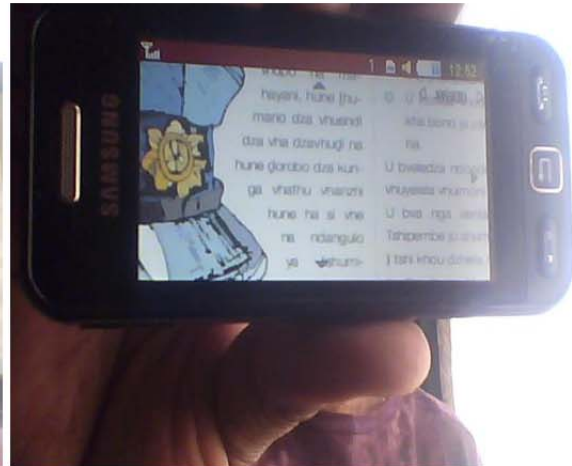


Figure 39; Perusal of the NDP 2030 Overview PDF file

Learners' SPs' features assisted them in making judgments of the NDP's worth, desirability and acceptability.

5.2.3 Appreciation

For background to this section refer to 4.2.2.19

The last week (week 13) was focused on imagery, a sub-type of the last learning type, appreciation.

Learners were given an SP-compatible slide to study figures of speech. They rewrote a given poem (which was not rich in terms of imagery), inserting figures of speech where necessary. Thereafter, they transformed a poem into a rap song that was video-recorded. . Imagery in poetry is what the words of the poem make the reader 'see' in their imagination. It is the sounds, colours, and sometimes feelings evoked by the poem.

They also converted their poems into traditional, gospel and rap songs, video-recorded these songs over their SPs, and shared them through an SP Bluetooth feature.



Figure 40; Transforming a poem into a video rapped song



Figure 41; Presentation of a transformed a video

The project was voluntary, integrated completely with the curriculum and all experiments did not necessitate any costs to learners. The two learners who did not participate and those who participated without SP-ownership were not disadvantaged in any way as they received all the materials produced by the project. Those who participated without SP-ownership benefited a lot from the project, despite the fact that they had no a device (SP) to carry some material home.

Chapter 6

Case Study Results

Findings from qualitative studies may take the form of a description of the phenomenon or themes under study, a narrative or an interpretive account of the understanding or meaning of an experience. The researcher of this study relied on the latter representation and will discuss the findings in the context of what is already known, irrespective of how the final outcome is presented. Furthermore, the researcher will relate the findings of the study back to the original research purpose, and demonstrate whether or not it has been thoroughly addressed¹⁴⁸.

As stated at the beginning of this study, the project took as its point of departure the premise that SPs are ideal computational devices to support and enhance Thomas Barrett's taxonomy and Benjamin Bloom's cognitive dimensions of learning.

Findings emanated from a survey and interviews that were conducted after the experiment with participants. They also stemmed from observations made by the researcher of participants' SPs' enhancement of the two taxonomies.

6.1 Learners' own evaluation

Learners were learning more deeply through their SPs than through the traditional way. The use of SPs in accomplishing some learning activities played a vital role in promoting understanding.

6.1.1 Survey

A survey about the project was conducted at the beginning of the third term. Twenty-five learners took part in the survey and gave feedback on a project in which we used certain

¹⁴⁸ Thorne S, Darbyshire P, 2005 1105–13

functions of SPs in our learning schedule in order to see if the use of such functions supports our learning processes.

Of the 25 participants, 16 used their own SPs, five borrowed them for this project, two worked with friends who had SPs, and two did not use SPs at all.

The survey afforded participants the opportunity to express their evaluation using the following scale: not agree = 1; partly agree/disagree = 2; agree fully = 3. They made a tick in the relevant box. The following is the survey sheet that was used, but in the scale tick boxes the researcher inserted the number of responses in each box by the twenty-five participants.

SECTION A: *How I participated in the Project*

Please tick the relevant box:

• <i>I used my own smartphone</i>	16
• <i>I borrowed a smartphone for this project</i>	5
• <i>I worked with a friend who has a smartphone</i>	2
• <i>I did not use a smartphone at all</i>	2

SECTION B: *My Impressions about the Project in General*

	Choose between		
	1	2	3
1. Through this Project my interest in Languages has increased a great deal		10	15
2. I looked forward to the next exercise using a smartphone function in my learning process	1	5	19
3. Through this Project my interest in Languages has increased a great deal		10	15
4. I looked forward to sharing with the class the recordings and photos that I produced	1	4	20
5. I enjoyed studying Tshivenda much more than previously	1	3	21
6. I have come to understand that language is more about communication and sensing than about spelling and grammar		8	17

7. Using a smartphone, connected my study of Tshivenda with my everyday world and brought my everyday world to the class	1	10	14
8. Using a smartphone made my study of Tshivenda practical	2	5	18
9. I think other subjects at school will become more interesting if they use the same functions		8	17
10. If I could connect my phone to the internet, it would improve the learning experience further		4	21

SECTION C: *How I experienced the Impact of the Project on my Learning Capabilities*

	Choose between	1	2	3
<i>Using the various smartphone functions:</i>				
1. helped me to remember much more of the details of my study material than I used to before		1	5	19
2. greatly improved my ability when I listen to people and read what they write, to identify who are making the same point, and who differ from them			7	18
3. greatly improved my ability when people talk or write a great deal, to summarise the most important points of their ideas in a few short sentences			10	15
4. greatly improved my ability to draw my own conclusions when I hear or read what other people are saying or writing			7	18
5. greatly improved my ability to see where people agree and where they differ, and then to draw my own conclusions about which position I find persuasive			8	17
6. taking pictures of items that reminded me of the essays and poems we were studying, helped me to interpret the study material in ways that I could not before		2	7	16
7. using audio functions helped me to interpret the study material in			7	18

ways I could not do before			
8. using the recording function allowed me a deep insight in our everyday use of language that I did not understand before	2	5	18
9. making recordings of my own ideas and insights greatly improved my ability to arrange my ideas and formulate them so that others can understand	2	8	15

6.1.1.1 Learners' Impressions about the Project in General

Fifteen (60%) participants agreed fully, and ten partly agreed, that through this project their interest in languages has increased a great deal. Nineteen (76%) agreed fully that they looked forward to the next exercise using an SP function in their learning process, while five partly agreed and one disagreed.

Regarding looking forward to sharing with the class the recordings and photos that they produced, 20 (80%) participants agreed fully, four partly agreed and one disagreed. Those who agreed fully that they enjoyed studying Tshivenda much more than previously were 21 (84%); three partly agreed and one disagreed.

Seventeen (68%) agreed fully that they have come to understand that language is more about communication and identifying than about spelling and grammar, and only eight partly disagreed. Fourteen (56%) agreed, ten partly agreed and one disagreed that using an SP connected their study of Tshivenda language with their everyday world and brought their everyday world into the class. Eighteen (72%) agreed fully that using an SP made their study of Tshivenda practical; five partly agreed and two disagreed.

Those who fully agreed that other subjects at school will become more interesting if they use the same functions were seventeen (68%) and eight partly disagreed. Twenty-one (84%) agreed fully that if they could connect their phones to the Internet, it would improve the learning experience further and only four partly agreed.

The percentages of those who agreed fully on their impressions about the project in general reveal all that the researcher anticipated in chapter four (4.2 Curriculum Correlation with Smart Functions).

6.1.1.2 How learners experienced the Impact of the project on their learning capabilities

Nineteen (76%) participants agreed fully, five partly agreed and one disagreed that the project helped them to remember more of the details of their study material than they had before.

This was anticipated in chapter four as it has been found that non-literary texts such as visual literacy, have become an important area of literal comprehension study, and SPs' screens rather than printed pages have become an exciting source of most of learners' information, and it is easier for them to recognise and recall details than when doing it the traditional way.

The project significantly enhanced participants' ability when they listen to people and read what they write to identify who is making the same point, and who differs from them – 18 participants agreed fully (72%) and seven partly agreed. This was also anticipated in chapter four when it was argued that learners can consolidate explicit ideas or information from more than one source (debates, discussions, etc.). They were able to record themselves synthesising their work and identifying the best recordings for future use.

Fifteen participants (60%) fully agreed, while ten partly agreed, that the project also greatly improved their ability to summarise the most important points made when people talk or write a great deal. By doing this, as anticipated in chapter four, learners improved the quality of summarising larger contents into shorter ones (e.g. photo stories) for presentations. They managed to increase their need to further communicate their thoughts, and it served as a means for familiarizing themselves with higher forms of expression, thus compelling them to use higher forms of literacy.

The project significantly improved learners' ability to draw their own conclusions when they hear or read what other people are saying or writing – 18 concurred fully (72%) and seven partly agreed. It was stated earlier (in chapter four - Curriculum Correlation with Smart Functions), that after listening to a talk show clip (recorded, stored and shared through their SPs), learners can express and draw conclusions through their own debates, small group discussions, and other structured discussion activities.

Seventeen participants (68%) agreed fully, and only eight partly agreed, that the project really improved their ability to see where people agree and where they differ, and then to draw their own conclusions about which positions they find persuasive. This was most evident in the way that their SPs' features assisted them in making judgments of the NDP's worth, desirability and acceptability.

Taking pictures of items that reminded participants of the essays and poems they were studying helped them to interpret the study material in ways that they could not before – 16 (64%) fully concurred with this while seven partly agreed and two disagreed. Pictures in this project became an ideal source for inference. The project revealed that they can make a

transformation of ideas from pictures to text. Learners are now in a position to infer by using pictures to get the implied meaning of the essay’s main idea and can do the same in other prescribed curriculum activities.

Eighteen participants concurred fully (72%) and seven partly agreed that using audio functions helped them to interpret the study material in ways they could not do before. SPs can assist learners in revisiting the same information (rewinding an audio clip), or doing the same exercises (re-recording) repeatedly without embarrassment until they are confident. This can also assist learners in developing the knowledge of language structures and conventions that will enable them to produce logical and solid texts.

Using the recording function gave learners a deep insight into their everyday use of language that they did not understand before – 18 participants concurred fully (72%), five partly agreed and two disagreed. Learners can make a meaningful connection to the grammar content they are working with while watching a video clip, followed by answering questions based on the clip itself.

Fifteen (60%) participants agreed fully, eight partly agreed and two disagreed that making recordings of their own ideas and insights improved their ability to arrange their ideas and formulate them so that they can be understood by others. This indicates that through SP recordings, learners can make judgements of appropriateness. This can offer learners the opportunity to create out-of-class recordings in order to demonstrate their proficiency. Through such a process, learners can also gain the ability to self-select the recordings they believe best represent their true level of proficiency.

6.1.1.3 The differences in participants’ responses

The researcher noticed that not all learners responded identically. Each learner was expressing his/her evaluation of the experiment, and this resulted in varied responses.

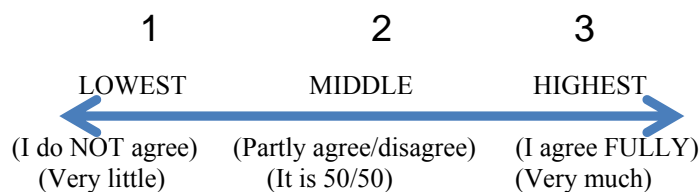


Table 3: Number of learners’ impressions and experiences ticks in accordance with the rating scale. There were 475 ticks (25 learners multiplied by 19 questions from the survey questionnaire).

<i>HOW THEY PARTICIPATED</i>	No. of Learners	1 LOWEST	2 MIDDLE	3 HIGHEST	TOTAL
<i>Those who used their own smartphones</i>	16	5	73	226	304
<i>Those who borrowed smartphones for this project</i>	5	3	30	62	95
<i>Those who worked with friends who have smartphones</i>	2	0	4	34	38
<i>Those who did not use a smartphone at all</i>	2	5	20	13	38
TOTAL	25	13	127	335	475

Table 4; Learners impressions and experiences' percentage

Percentage of;	No. of Learners	1 LOWEST	2 MIDDLE	3 HIGHEST
<i>Those who used their own smartphones</i>	16	1.6%	24%	74.3%
<i>Those who borrowed smartphones for this project</i>	5	3.1%	31.5%	65.2%
<i>Those who worked with friends who have smartphones</i>	2	0%	10.5%	89.4%
<i>Those who did not use a smartphone at all</i>	2	13.1%	52.6%	34.2%
TOTAL %	25	4.4%	29.6%	65.7%

Based on information from 16 learners who used their own smartphones, only 1.6% disagreed, 24% partly agreed/disagreed, and **74.3%** fully agreed. The five learners who borrowed smartphones for the project evaluated in this way: 3.1% disagreed, 31.5% partly agreed/disagreed, and **65.2%** fully agreed. Those who worked with friends who have smartphones evaluated in this manner: 0% disagreed, 10.5% partly agreed/disagreed, and

89.4% fully agreed. And, finally, those who did not use a smartphone at all rated in this way; 13.1% disagreed, 52.6% partly agreed/disagreed, and **34.2%** fully agreed.

Based on the ratings explained above, it is clear that learners valued the use of SPs in their learning, and they rated positively in the survey. The most important revelation was on two learners who had no SPs but worked with friends. No one disagreed to any question; only four ticks were made (10.5%) in the “partly agreed/disagreed” column, and the rest of the ticks (89.4%) were in the “fully agreed” column.

Although there is justification of differences in their responses, the researcher believes two participants were not so serious about the survey. They are the highest to disagree (13.1%) and the lowest to agree (34.2%). They contributed significantly to the overall 4.4% of those who totally disagreed with some of the questions. The two participants, who were not so serious, did not bother to borrow SPs or work with others. Throughout the experiment they were not co-operative.

The responses of those who managed to borrow SPs or work with others were positive, although one participant who worked with others indicated after the survey that in most of her answers she ticked the “partly agree/disagree” column because her limited access to other learners’ SPs hampered her chances of excelling in most activities. Nonetheless, she was positive about the experiments.

6.1.2 Interpretation of learners’ responses

The following is the researcher’s interpretation of responses given by learners after their participation in a survey.

6.1.2.1 Literal comprehension,

Participants noticed the support that SPs provide to literal comprehension. Through SP features (video, audio, camera, PDF and PPT) they can recall, identify or locate an incident described in a story, names of characters, the setting of a story, or the time a story took place when such facts are explicitly stated in the selection. They can also recall, identify or locate likenesses and differences among characters, times in history, or places that are explicitly compared by an author.

By viewing an MP4 video, a camera photo, an SP PDF or PPT file, or listening to an MP3 audio file, participants recalled, identified or located an explicit statement which is the main idea of a paragraph or a larger portion of the text in that file and/or the order of actions or incidents explicitly stated.

6.1.2.2 Re-organisation

With the help of their SPs features, participants were able to place people, things, places and/or events into categories. They could recognise or recall certain kinds of details, relationships, or traits at a lower level of the taxonomy and then sort them into a category or a class.

Participants were able to organise the selection in outline form using direct statements or paraphrased statements from the selected SP file. They were also able to condense the selection using direct or paraphrased statements from the selected SP file.

Participants used their SPs to organise their notes and images. They created notebooks of documents and then stored them on the device or exported them (as a PDF or an image). This allowed participants to take pictures of documents, crop them, and then enhance them for ready viewing. Their built-in camera feature could also function as a scanner to capture notes from the board or a page from a book.

6.1.2.3 Inferential comprehension

Participants felt that the experiment has taught them that literal content of the text from SPs functions led them to suggest additional facts the author might have included in the selection which would have made it more informative, interesting, or appealing. They also conjecture as to what might have taken place between two explicitly stated actions or incidents.

Participants could listen to, view or read a file from their SPs and thereafter hypothesize about the motives of characters and their interactions with others and with time and place and conjecture as to what caused the author to include certain ideas, words, characterizations, and actions in the text. They can also hypothesise about the nature of characters on the basis of explicit clues presented in the audio, video, photo, PDF or PPT file. From such files participants had to conjecture about the outcome of the selection. After involving SP files, they could predict the end of a story, infer literal meanings from the author's figurative use of language, and/or provide the main idea, general significance, or theme which was not explicitly stated in the text.

Using SPs' audio feature, participants were in a position to express their feelings or thoughts, introduce people; give instructions and directions. They also seemed to enjoy watching a story unfolding before their eyes, rather than reading it without any other kind of sensory input. The acquisition of oral skills through SPs' audio and video features supported efficient communication and the use of language in diverse social settings.

As participants carried on constructing meaning from images and words, they intensified their need to further communicate their thoughts. Their construction served as a means for departure toward higher forms of expression, thus compelling the usage of higher forms of literacy. Participants are now able to create images using the senses to help them to remember details, interpret information, make predictions, draw conclusions and assist with comprehension. This is the reason we find phrases like “When I read this passage (statement, article, phrase or book) I can see

6.1.2.4 Evaluation

Participants indicated that with the assistance of their SPs they can make an evaluative judgment by comparing ideas presented in the selection with external criteria provided by the teacher, other authorities, or other written sources, or with internal criteria provided by their experiences, knowledge, or values. One respondent recalled one experimental activity (Oral: Listening for critical analysis and evaluation) in which they judged whether a statement was fact or opinion after having listened to an advertisement on their SPs.

Another respondent indicated that using her SP she can get an audio or visual story/passage, and decide which character is the most similar to her own personality, or ask herself questions like “Why did this happen? How do I believe this?”

a) Judgement of fact or opinion

Learners used their SPs to record an advertisement which was critically listened to. They recorded themselves judging whether what the advertisement proclaims is a fact or an opinion; for example, an advertisement might assert that one brand is the best in the world, despite the lack of concrete evidence to support such a claim.

Learners realised that advertisements can tell consumers about prices and other information that may help them in the decisions they make about what to buy, but advertisements are also used by sellers to show a product in the best light.

Learners had a lengthy discussion about a well-known washing powder advertisement. They also indicated that factual claims in the ad should be supported with evidence in order to protect consumers and make sure that competition among sellers is fair in the marketplace. Others refuted the idea saying that it is acceptable for sellers to talk only about the positives and ignore the negatives of what they are selling, and that it is up to the consumers to separate factual claims from opinions and exaggerations.

b) Judgments of Appropriateness

Through the use of SPs, participants' video clips revealed both verbal and non-verbal techniques for presentations. They had to judge whether such techniques were used appropriately in line with what the poem/speech is saying.

Using their SPs' video feature, participants were able to make judgments of appropriateness in terms of both verbal and non-verbal techniques – something that would be impossible without the use of SPs.

c) Judgments of Worth, Desirability and Acceptability

Reproducing a drama in an MP4 video format encouraged participants to learn how to tell a story in more pleasant and interesting ways. Participants enhanced their vocabulary and now know more about conversations.

6.1.2.5 Appreciation

a) Emotional Response to the Content

Participants were able to judge emotions expressed in the speech. They were also in a position to empathise and sometimes sympathise when selecting such emotive phrases.

b) Reactions to the Author's Use of Language

Participants realised that using their SPs to record interviews with their parents, grandparents, uncles and/or aunts about their stories and personal histories is an amazingly influential resource for a Tshivenda classroom. Such recordings enabled learners to create, modify, and share audio files.

Using SP features, participants believe they can become emotionally and aesthetically sensitive. After having viewed a photo, PDF file, PPT file, video clip, or listened an audio clip from their SPs, they can become emotionally and aesthetically sensitive and react to the worth of its psychological and artistic elements.

6.1.3 Informal discussions with learners

The researcher and his supervisor who visited the school for interview observation had an informal discussion with some learners where the following cropped up:

6.1.3.1 Inequality of SP ownership

About one third of the class did not use SPs during the project. Some do not come to school with them due to crime prevention or instructions from parents, while others do not own any. Participants we had discussions with indicated that they managed to share with others as most of the things were done in groups. Those who left their SPs at home would have the opportunity to proceed with their work, but it was unfortunate

for those who do not have any. Nonetheless, when they get one, they will have already gained the know-how of applying it for educational purposes through sharing during the project.

6.1.3.2 Connectivity

During the discussions, participants also indicated that although everything went smoothly in the absence of connectivity, which was not necessary for this project, they feel there is a lot more that SPs can do if they can gain access to cheaper or free connectivity. They cited some examples such as downloading important information and sharing it where Bluetooth techniques cannot manage to do it.

One participant believed Internet access should be free for consumers. She indicated that businesses and advertisers should pay for the cost of the Internet. Her thought was that the advertisers should pay, just as someone who owns a radio does not have to pay for listening to a radio station. She says Internet access should be part of a package when one purchases an SP or computer.

6.1.3.3 SPs' screen sizes:

Participants indicated that the screen size is small compared to tablets, laptops, etc., but this does not deter them from doing what they want to.

6.1.3.4 Consolidating Ideas/Information

Participants were delighted that they can also consolidate explicit ideas or information from more than one source (from many MP4s, MP3s, photos, PDFs, PPTs or from their combinations). They are able to put together information from more than one place and combine it in order to provide a single answer to a question. One respondent cited a very good example, saying that sequences of pictures can be rearranged to have participants come up with their own stories.

6.1.3.5 Audio books/guides

Participants were excited and indicated that the benefit of listening to an audio book is that they can focus on it while doing other things. They no longer hold the book physically and turn pages. They can listen to the book while doing home chores, bathing or relaxing. Another benefit is that audio books occupy much less physical space than traditional books. Although audio books are not likely to replace traditional books, they do provide an extension of convenience in circumstances where a

traditional book would be difficult to enjoy.

6.1.3.6 Camera (photos and images)

Participants showed a great interest in the experiment and they indicated that they were able to place pictures in a specific order to show the progression of concepts, emotions, and events. Another interest was in the fact that photo mind-mapping can also be applied to their personal plans and long term goals.

Pictures are an ideal source for inference. Participants are in a position to infer by using pictures to get to the implied meaning of essay main idea. Participants can construct meaningful learning outcomes from words and pictures. This reminded me of Laspina, who in his book, *'The visual turn and the transformation of the textbook'*, contends that images and words might work together to form a "partnership"¹⁴⁹. The affiliation between images and words works as a platform, allowing students to create meaning. His idea is also supported by Arnheim who believes that it is the "productive thinking" that will ignite the need to speak or write in order to communicate thoughts that are perceived¹⁵⁰.

6.2 Theoretical and professional evaluation

6.2.1. Researcher' s (Observer' s) explicit report of his evaluations

The researcher, as a professional educator, made judgements regarding the reliability of learners' opinions and evaluations of the cognitive contribution to the various levels of Barrett's criteria of the SP functions. (An appendix regarding this is to be found in the appendices section.) Such levels are:

6.2.1.1 Literal comprehension

The researcher's observation regarding literal comprehension is that learners' opinions are reliable because, through SP functions, learners were able to recall, identify or locate an incident described in a story, names of characters, the setting of a story, or the time a story took place. Throughout the experiment learners were identifying, recalling, and locating similarities and dissimilarities among characters, times in history, and places that were explicitly compared by prescribed literatures' authors.

The researcher (observer) also observed Bloom's cognitive contribution to this level of

¹⁴⁹ Laspina, J. A., 1998, 36

¹⁵⁰ Arnheim R. 1986, p.138

Barrett's categories. Through remembering, learning with SPs supported learners in recalling data and information. Also noticed was that learners are able to recall (remember) settings, facts, patterns, and methods previously learned through the use of SP functions.

6.2.1.2 Re-organisation

The researcher detected in this category that SPs' features played a vital role in supplementing learners' knowledge and skills to place people, things, places and/or events into categories. From his point of view, learners are now able to recognise and recall certain varieties of details and relationships and then sort them into a category or a class. Another observation in this regard is that their opinions reflect their capabilities to reduce the selection using direct or rephrased statements from carefully chosen SP files.

Bloom's cognitive dimension fits in this category through understanding analysis and synthesis. With the aid of their SPs, learners demonstrated their ability to understand the meaning, translation, interpolation, and interpretation of instructions and problems (understanding). They validated the fact that they can separate materials or concepts into component parts so that the material/concept's organisational structure may be understood (analysis). They also confirmed that they can categorise, combine, create, reorganise, and summarise (synthesis).

6.2.1.3 Inferential comprehension

The researcher supports learners' opinions that the use of SP functions in the experiment has enabled them to conjecture about supplementary facts omitted by authors that might make the selection more instructive, fascinating, and engaging. He observed that learners can also conjecture about what motivated the author to use certain ideas, words, characterisations and actions in the writing, and about the outcome of the selection. Their opinions are also supported by the fact that they can generate images via their intellects to aid them in recalling details, interpreting information, making predictions, drawing conclusions and assist with whole comprehension.

Remembering, comprehension (understanding) and analysing are the cognitive contributions that were made by the use of SPs in this category. Learners can depend on their SPs to remember and understand certain details, to analyse some information and to distinguish between facts and inferences.

6.2.1.4 Evaluation

Learners' opinions supporting the idea that SPs played a vital role when dealing with

judgment were consistent, and they concentrated more on qualities of reality, fantasy, accuracy, acceptability, desirability, worth, appropriateness and probability of occurrence.

One of the other things the observer noticed is that through their SPs' audio recordings, learners were able to self-reflect and were made aware of SPs' opportunities in refining their fluency and oral skills. They also displayed an exciting idea of self-evaluating their work and identifying the best recordings for storage. The other observation was made when they created out-of-class recordings in order to demonstrate their proficiency. By undertaking such a process, learners had the ability to self-select the recordings they believed best represented their true level of oral proficiency (poem presentation). The experimentation encouraged learners' interest and motivation in story retelling. Learners enjoyed story retelling, and it enriched their vocabulary and increased their knowledge.

It is correct, as indicated by learners, that they enhanced their vocabulary and now know more about conversations. Drama is all about interaction, movement, voice, staging, etc. It is not only about words and language. When it is played on stage it moves indispensably; how characters interact, what happens when they are not talking; the way body expressions can shift the meaning of a line. This was all knowledge gained from this experimental project.

The cognitive contribution that was made by the use of SPs in this category is Bloom's evaluating dimension, because learning with SPs assisted them to make judgments about the value of ideas and materials.

6.2.1.5 Appreciation

The researcher concurs with learners that they were able to judge emotions expressed in the speech when using SP functions. The researcher discovered that learners were able to detect distress inferences from voice cues in listening to the speech or discussion where they were required to judge the emotions expressed in speech instances.

Through recordings of relatives when working with the author's use of figures of speech, it was evident that learners developed the knowledge of language structures and conventions that enabled them to produce logical and solid texts. It would be a mammoth task for learners and their relatives to discuss why such figures have been used rather than simply identifying them, but the researcher realised that this was not a simple task for most relatives.

The researcher also agrees with learners' opinions that through the use of SP functions they can become emotionally and aesthetically sensitive. Such features can, after their applications, allow learners to a) voice their feelings about the selection in terms of fear, hate,

interest, excitement, amusement, boredom, etc.; b) confirm their sympathy for, empathy with, and sensitivity to characters, happenings, and ideas portrayed by the author; c) react to the author's artistry in terms of the semantic dimension of the selection, namely, connotations and denotations of words and d) express their feelings with regard to the author's artistic ability to paint word pictures which cause them to feel, hear, smell, taste, or visualize.

There was no cognitive contribution that was made by the use of SPs in this category. Instead, the use of SPs' functions contributed to the affective domain as it includes the manner in which we deal with things emotionally, such as appreciation, feelings, values, enthusiasms, motivations, and attitudes.

6.3 Observations from the point of view of the participant observer

6.3.1. Participants' responses

Participants developed know-how in viewing a wide range of non-literary texts, including visual texts. For many, SP screens rather than the printed page became an interesting source of most of their information. Visual literacy became an important area of literal comprehension study, and the SP screen a rich source of material.

Participants were able to collect and synthesise information, construct knowledge, solve problems, and express ideas and opinions. They are now able to recognise values and attitudes embedded in texts and to challenge biased and manipulative language.

The Tshivenda classroom can, through participants' SPs, accumulate incredibly powerful resources if learners record themselves interviewing their relatives (grandparents, uncles, aunts) and community elders about histories and anecdotes relevant to Tshivenda as a language, its people and culture.

Audio books can be used to improve general literacy. For participants with limited reading skills, listening to audio books will assist them in grasping meanings of complete sentences and deciphering individual difficult words.

Learners' ability to differentiate fantasy from reality has been seriously underestimated because of methodological problems and overgeneralisation from their performance in situations in which they had no control over the content of the fantasy and/or were presented with misleading information. It is important to keep in mind that there are many types of fantasy-reality distinctions, and that cultural context plays an important role in the interpretation given to children's activities.

Presenting traditional, gospel and rap songs was one of the most enjoyed experiments since learners fantasised a great deal. The experiment confirms that we can produce learners who use their skills to develop and present correct visual and multi-media texts for a variety of purposes - Barrett's synthesising and Bloom's creating.

Almost all participants expressed their enthusiasm to learn with the aid of their SPs, indicating that learning becomes interesting and they concentrate more on their work than when they are doing it in the traditional way. The researcher noticed this during experimental time, where participants were not pushed into the classroom. Most of them would be in the class even before their break came to an end.

6.3.2 Teachers' responses

Advancement in SPs features for individual recordings may provide teachers with the opportunity to collect digital oral production artefacts from learners, while at the same time reducing the amount of class time required for oral assessment.

Teachers who had informal discussions with the researcher were delighted after noticing learners' SPs play a role in knowledge discovery, capture, storage, sharing (transfer) and application. Participants and other Grade 12 learners were able to access all previous papers and their memos – from 2008 to 2012 - for all subjects from their SPs.

6.3.3 School response

The school Principal has, throughout the project, been thrilled about the project's progress and continuously gave the researcher words of encouragement. This was also noticed by the researcher's supervisor who visited the school for learners' interview observation.

A number of the school's heads of various departments have also given the project a green light. They were delighted when learners accessed video lessons for several subjects through their SPs.

6.3.4 How research results relate to the research objectives and research questions

At the beginning of this chapter, the researcher indicated that he will relate the findings of the study back to the original research hypotheses and purpose, and demonstrate whether or not it has been thoroughly addressed

6.3.4.1. Findings based on learners' acceptance of SPs in the context of learning;

About sixty percent of participants agreed fully, and forty percent partly agreed, that through this project their interest in languages has increased a great deal. Seventy six percent agreed fully that they looked forward to the next exercise using an SP function in their learning

process. Sixty-eight percent fully agreed that other subjects at school will become more interesting if they use the same functions, and thirty-two percent partly disagreed (*Refer to the survey sheet in 6.1.1, the explanation 6.1.1.1 and tables 3 & 4*). Such a percentage (60%) indicates that the research questions were methodically addressed.

6.3.4.2. Findings based on the impact of cognitive functions triggered by SPs on the learning process itself: The researcher has systematically explained that in 6.1.2 and 6.2.1, and believes the research questions have been thoroughly addressed (*Refer to 6.1.2 and 6.2.1*).

6.3.4.3. Findings based on the impact of use of SPs' multimedia in boosting a higher level of learning, than the usual one-dimensional teaching process: Seventy-six percent of participants agreed fully, twenty percent partly agreed and four disagreed that the project helped them to remember more of the details of their study material than they had before (*Refer to 6.1.1.2 and tables 3 & 4*) This percentage (76%) also shows that the research questions have been systematically addressed.

6.3.5 Researcher's view of the whole process

The researcher viewed the whole experiment as proof that learners' SPs play a role in knowledge discovery, capture, storage, sharing (transfer) and application.

With the aid of SPs, new explicit knowledge was discovered through combination, wherein the multiple bodies of explicit knowledge (and/or data and/or information) were synthesised to create new, more complex sets of explicit knowledge¹⁵¹. In terms of tacit knowledge, learners incorporated multiple streams with the aid of their SPs for the creation of new knowledge which occurred through the mechanism of socialisation - the synthesis of tacit knowledge across individuals, usually through joint activities rather than written or verbal instructions.

¹⁵¹ Nonaka I. 1994

Chapter 7

Conclusions and Implications

7.1 Conclusions

The project has experimentally and successfully investigated the understanding of integrating SPs in secondary school education curricula, and their possible contribution to the country's education system. The study has addressed the feasibility of incorporating SPs to enhance the language-learning experience of South African secondary learners. It has revealed that once learners begin using their SPs for learning, they develop a sense of appreciating the benefits of the tool inside and outside of the classroom.

7.1.1 State of multimedia based education (MBE) or audio visual education

Most learners in rural and urban schools own SPs and, as with other aspects of their lives, they will rely on them to enhance their learning experience. SPs penetration rate in all parts of the country has considerably increased the relevance of incorporating the tool into our education system.

It is not all schools in South Africa that are effectively resourced in terms of MBE or audio-visual education equipment for use in the classroom. The incorporation of SPs will create a virtual classroom without the considerations of electricity supply, video recorders and video viewers, audio recorders and audio players, and, of course, camera and photo viewers. This will reduce the gap that exists between resource-deprived and resource-advantaged learners within the same education system. Learners in remote areas (rural and other township schools) will no longer suffer an unfair disadvantage compared to those who have access to MBE resources in the classroom.

7.1.2 Education Authority's elucidation

According to the DBE's statistics released when briefing the parliamentary portfolio committees on basic education and communication, only 6107 of the country's twenty five

thousands eight hundred and seventy schools are ICT-enabled¹⁵². It also reveals that the proportion of schools with ICT infrastructure for teaching and learning had increased from 26.5% in 2002 to 31% in 2011 when the survey was completed. The challenges that were encountered, according to the department's e-learning director, were the lack of funding for ICT projects; lack of staff trained in ICT; limited internet connectivity in rural areas; and the high cost of connectivity.

As the e-learning director has indicated that they are coming up with a new ICT plan, I hope they consider the use of SPs as a supplement to the new plan in order to include learners from all walks of life (technologically advantaged and disadvantaged or urban and rural areas). I trust the plan will also accelerate the implementation pace because if the old plan was not rendered antediluvian, it would have taken some decades (26.5% in 2002 to 31% in 2011) to reach its target.

The GDE has come up with another solution which, it says, will resolve the impasse. The new project, renamed the "e-Learning Solution", will replace the Gauteng Online (later known as SMMT Online) which had already installed computers in 1552 of a total of 2200 institutions. Gauteng province's finance minister said that with the dawn of important developments in technology, "the physical computer laboratory was rendered obsolete"¹⁵³. In addition, tablets were now the preferred technology.

It is true that physical computer labs are outdated and tablets are a worthy alternative. I think it will be smart to consider the use of smartphones as a supplement to such a plan because each school will be given forty tablets, and it may take some years to provide each learner with his/her own tablet. The forty tablets to be given out to each school will remain in the school premises after school and during vacations, whilst learners' SPs are always in their pockets.

The provincial government is envisaging the future classroom that will result in all learners using their own devices (such as tablets, SPs, netbooks, etc.) that would contain all their e-Books and grade-specific curriculum content. Opportunely, this study was investigating just this. Participants who took part in this study, and others who did not partake, already have specific curriculum content on their SPs in the form of audio and video study guides/books, PDF files (question papers & memos), PPT files, audio/video oral presentations, etc.

¹⁵² City Press Newspaper 2013 September 1

¹⁵³ South Africa Government Information 2013 August 14,

This study has investigated how SPs might be used to support language learning. The researcher would like to make a humble request to those who want to push for a complete ban on SPs in South Africa's secondary schools to give other researchers opportunities to further investigate the use of this tool in enhancing learning in other content subjects. Their adherence to the request will protect those learners who are MBE resource-underprivileged in certain parts of the country.

7.1.3 Exposure to Knowledge Management

The researcher regards this project as an exposure to learners about Knowledge Management (KM) processes, sub-processes, systems, and technologies. According to Becerra-Fernandez and Sabherwal, KM is defined as performing the activities involved in discovering, capturing, sharing, and applying knowledge so as to enhance, in a cost-effective fashion, the impact of knowledge on the unit's goal achievement¹⁵⁴.

The use of SPs and their multimedia capabilities - as indicated throughout the project - benefited language learners by allowing them to acquire additional accurate learning experiences. This has undeniably and inventively enabled learners to develop the skills and knowledge they need to achieve personal goals and to be contributors in the global community.

7.2 Implications

Today's SPs are equipped with audio and visual media that has been developed to the extent that they have incorporated the features of a number of other devices. One of the most interesting things is that SPs' videos, audio recordings and images can be used in two different ways: as instructional resources when translating a scientific text and as objects of translation in processes such as dubbing, audio description and camera.

SPs are still going to be revolutionized in such a way that they will be similar to laptops. There are people out there who are having sleepless nights trying to come up with solutions that will satisfy everyone. While the Russian natural gas exporter's chief executive officer, Alexey Miller, is demanding a tablet computer that could impersonate all of the functions of a PC, a South African software billionaire, Mark Shuttleworth, is pursuing a 32 million dollar effort to develop an SP that can replace a desktop computer. The phone will have the fastest processor on the market (with as much memory as a laptop's four gigabytes), and 128 gigabytes of storage space. It will also have 4.5-inch sapphire crystal screen which cannot be

¹⁵⁴ Becerra-Fernandez I. and Sabherwal R. 2010

easily scratched.

For now, it is important for the language learners to correctly generate and develop comprehensible output as well as to appropriately comprehend linguistic input. This can be enhanced by integrating SPs into our education system, because the process of generating multimedia learning materials itself is a beneficial instance of task-based learning¹⁵⁵.

7.2.1 The way the curriculum can be adapted to make better use of the facilities that SPs provide

7.2.1.1 E-portfolios

Towards the completion of this project the researcher noticed that e-portfolios can be possible if SPs are allowed and used appropriately in our school yards. An e-Portfolio is a collection of digital text, images, audio, video clips or PDF or PPT presentations prepared by learners¹⁵⁶. They are not different to paper-based portfolios, except that the pieces encompassed in them are digital in nature, easy to store and retrieve, and can be assessed anytime and anywhere. E-portfolios for all learners in a school will need a single laptop hard drive to store, but paper-based portfolios will need a number of classrooms. This will also make it easier for the school to retrieve a portfolio file a decade after a learner has left a school. In terms of costs, e-portfolios are more affordable and more cost effective than paper-based portfolios.

With a tool like an SP in the hands of many learners, one thinks of the manner in which it can become an enabling factor for e-portfolios. With it, learning opportunities can be maximised by assessing language tasks inside and outside the classroom. Assessing all learners' tasks (like prepared speech, reading, response to literature, etc.) during contact time is time-consuming. Using e-portfolios will ease learners' performance agitation, allow the teacher to assess work in his/her spare time and boost the instructional time.

7.2.1.2 Out-of-class tasks

With the advent of SPs in our learners' hands, the education authority may consider allowing teachers to dispense out-of-class tasks to FET (grades 10 to 12) classes, where learners can record and submit audio or video clips responses outside of the traditional classroom. As soon as learners become pleased with the recording, they can save the task file in their SPs, giving the surname and T4 as a file name to indicate that the recorded file belongs to so-and-

¹⁵⁵ Joseph, S.R.H., & Uther, M., 2009, 4(1) 7-32

¹⁵⁶ Blair, R., & Godsall, L. 2006. One school's experience in implementing e-portfolios: Lessons learned. *The Quarterly Review of Distance Education*; 7(2), 145-154.

so and is Task Four (e.g. oral; speech). Learners will submit their work to the teacher, who will use a USB cable or Bluetooth feature to transfer tasks from learners' SPs to his/her laptop.

Standing in front of a class and making a presentation may create anxiety and stress amongst learners, which can hamper learner performance¹⁵⁷. Learners may be less perturbed by recording responses to language tasks for assessment purposes than being evaluated orally in class. This will give them the opportunity to listen to their preliminary response and correct or review their work prior to submission for evaluation.

7.2.1.3 Oral moderation clips

Grade 12 oral activities are finally moderated during the months of July and August each year. A number of selected learners from cluster schools converge and are moderated by a panel of teachers and subject advisors. Video and/or audio-recorded clips of the moderation process may be used to motivate the subsequent Grade 12 class by displaying such clips at the beginning of the year. After viewing, learners will be encouraged to perform better than the preceding class.



Figure 42; Orals moderation clip

Such clips, especially when video-recorded, may also be used as evidence that moderations were carried out, thus giving teachers and subject specialists the opportunity to reassess the process during their own appropriate times. This can also assist in developing a repository of information by recapturing, storing and sharing best-practiced activities

7.2.1.4 Video-sharing websites (downloading and uploading)

Subject advisors, e-learning officials, teachers and some learners who can afford connectivity may discover, capture, store and share a number of learning materials for all subjects. While

¹⁵⁷ Woodrow, L. 2006. 37(3), 308-328.

other content subjects' and English language's Communities of Practice (CoP) may spend some time downloading, African Language CoPs should start uploading files to video-sharing websites because their repositories are empty. Learners and teachers should be encouraged to regard websites like YouTube as an example of video best practice.

7.2.2 Possible solutions to problems identified

7.2.2.1 Inequality of SP ownership

In the previous chapter, the researcher emphasised learners' concerns about those who do not own an SP. Although they indicated that the problem was resolved by sharing SPs with the have-nots, this might not be the case with other classes or schools.

The education authority can resolve this by purchasing the cheapest SPs for the have-nots. Such tools will remain the property of the education department. They will be given to the have-nots at the beginning of that year – just like textbooks – recorded in the inventory database, and be retrieved at the end of the phase. Learners will be allowed to remove their SIM cards when handing in the device.

The researcher understands that to many this might not seem feasible, but the number of have-nots is declining on a daily basis, and the unattractiveness and lower price of such SPs will discourage the haves from claiming to be have-nots. Another mechanism of giving out such SPs, bearing in mind the reduction of costs, might be to start with the Grade 12s, going downward to the 10s. In higher grades the have-nots are lesser than in lower grades – it was less than one third of have-nots in the class that participated in this project.

7.2.2.2 Connectivity

In the past there were a number of free Internet service providers, but since the growth and accessibility of broadband Internet services have increased, most of these companies have either retired from business or are now charging a small fee for their Internet access.

The education authority may negotiate with service providers such as MTN, Vodacom, Cell C, etc. to supply learners with free or cheaper Internet connectivity. Service providers may restrict certain sites and limit access to educational ones. Most cellular service providers have their own website that is free to browse if you belong to that service provider.

Using Internet handler applications such as Opera Mini Labs may also enable learners to enjoy browsing, downloading, and even blogging for free.

7.2.2.3. SPs' keyboard and screen sizes

As communication is a crucial learning skill, a data projector will allow learners a whole new

dimension in the way they share ideas, information, animations, charts, images, audio or video. Scientists have come up with a idea for a tiny projector that would connect to any kind of SP and permit the user to control the SP from the projection itself (touching from the projection, not from the phone). This is something that will resolve the problem of SPs' small screens and touch keyboard size.



Figure 43; Projector that permits the user to control the SP from the projection itself

SPs, as an alternative to mobile phones which carry the primary function of enabling only two-way communication by text or calls, have other extended in-built high-quality capabilities. There is a possibility that in a few years' time they will have an in-built projector.



Figure 44; Envisaged SP in-built projector

Advanced technology will soon enough address the issue that the smaller the projector is, the less light it will be able to give out. By striving to make projectors a part of our new learning experience, we will be in a position to resolve the long talked-about problem of SPs' small screen size.

7.3. Endnote

The researcher realized the goal of this project by providing a framework of understanding comprehension and the use of smart mobile technologies. This was a major step in conducting research on this matter, based on Barrett's learning types and Bloom's cognitive dimensions of learning. A literature review was done to acquaint the researcher with the reflections and views relating to the use of mobile devices to enhance learning. A full

elucidation of comprehension was provided, and research methodology was elucidated to highlight the process followed in undertaking this research project.

Emphasis was placed on experiments carried out to prove that SPs are excellent mobile devices to support and enhance taxonomies that can assist in synthesising and developing comprehension strategies. Finally, the results of the project were delivered, stemming from interviews, a survey and observations.

The focus of this project was on language learning types and the cognitive dimensions of learning using SPs' features. The researcher believes other researchers will conduct further studies on the use of SPs in other subjects, applying various processes and techniques. Their contribution will be momentous in developing a database that will be a cascade for the realisation of e-learning, e-education, e-portfolios, e-assessment, etc.

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APPENDICES

APPENDIX 1

RESEARCHER OBSERVATION SHEET BASED ON BARRETT TAXONOMY

Group Name:

Observer: K.S. Mamugudubi

Poor (Low) = 1, Fair = 2, Satisfactory = 3, Very Good = 4, Excellent (High) = 5

Learning Type	Learning Sub-type	SP Usage with activities					
			Poor = 1	Fair = 2	Satisfactory = 3	Very Good = 4	Excellent = 5
1. Literal Comprehension	1.1 Recognition or Recall of Details	Are learners able to recognize events that took place in a video clip of a Tshivenda song from their SPs?	1	2	3	4	5
		Are learners able to recall by responding to questions based on the song.	1	2	3	4	5
	1.3 Recognition or Recall of a Sequence	Can learners use smart phones to take pictures allied to an essay?	1	2	3	4	5
		Can they be in a position to place such pictures sequentially?	1	2	3	4	5
	1.5 Recognition or Recall of Cause and Effect Relationships	Are learners able to recall key elements of a prescribed drama guide stored in their SPs (in compatible PDF format)?	1	2	3	4	5
2. Reorganization	2.1 Classifying and 2.4 Synthesizing	Are learners, after a listening activity through their SPs, able to classify things in a discussion?	1	2	3	4	5
		Can learners use the same talk show recordings to formulate their own debates?	1	2	3	4	5
		Can they use the same talk show recordings to formulate other structured discussion activities?	1	2	3	4	5
	2.2 Outlining and 2.4 Synthesizing	Can learners identify grammatical words from a Tshivenda video song?	1	2	3	4	5

		Can they provide answers by creating own paragraph in a written form?	1	2	3	4	5
		Can they convert written answers to an AMR audio format (creating)?	1	2	3	4	5
	2.3 Summarizing	Can learners take photos of objects or scenes signifying the passage? Can they summarize the passage as a photo story or PowerPoint presentation?	1	2	3	4	5
	2.4 Synthesizing	Can learners reproduce the elements of a drama in an Adaptive Multi-Rate (AMR) audio format?	1	2	3	4	5
3. Inferential Comprehension	3.1 Inferring Supporting Details:	Can learners, after listening to the Tshivenda news, record themselves conjecturing about additional facts the news reader might have included which would have made the news more informative and interesting?	1	2	3	4	5
	3.2 Inferring Main Ideas	Can learners gather pictures through SP cameras in order to link ideas to model relationships of concepts?	1	2	3	4	5
	3.4 Inferring Comparisons:	Can learners use their SPs' cameras to take pictures of urban and rural areas in support of an argumentative essay?	1	2	3	4	5
	3.7 Predicting Outcomes:	Can learners, after studying their PDF file comprising exposition, rising action and conflict of the novel, be in a position to write a note predicting the outcome of climax, falling action and denouement?	1	2	3	4	5
		Can they take a photo of their notes, and circulate them through SP Bluetooth to other groups for comparisons?	1	2	3	4	5
3.8 Interpreting Figurative Language	Can learners bring short video clips of them presenting a poem, Can they, in such clips, show cognizance the figurative use of language; the way sentences, verse lines, and poems as a whole are presented, the choice of image, rhythm, pace and, sound?	1	2	3	4	5	
4. Evaluati	4.1 Judgments of Reality or Fantasy	Can learners share, through blue-tooth, the best presented poems to help improve theirs?	1	2	3	4	5

		Can they fantasize by composing a song out of a poem?	1	2	3	4	5
	4.2. Judgments of Fact or Opinion:	Can learners use their SPs to record an advertisement which will be critically listened to or viewed?	1	2	3	4	5
		Can they record themselves making a judgement on whether what the advert proclaims is a fact or opinion?	1	2	3	4	5
	4.5 Judgments of Worth, Desirability and Acceptability	Can learners combine reproduced elements of a drama with other learners' elements to compile an audio study guide?	1	2	3	4	5
		Does this allow learners to develop the ability to retell a story making use of various techniques?	1	2	3	4	5
		Can learners, through SPs' Bluetooth feature, share a PDF file of the National Development Plan 2030 Overview (Tshivenda version)?	1	2	3	4	5
		Can they record (audibly) themselves determining whether the plan is having substance, desirable and acceptable?	1	2	3	4	5
5. Appreciation	5.1 Emotional Response to the Content	Can learners select a number of emotive words from a recorded FM speech?	1	2	3	4	5
		Can they recorded discussion, and incorporate them into a piece of writing - appropriate to the context?	1	2	3	4	5
	5.3 Reactions to the Author's Use of Language.	Can learners record themselves, with their parents, discussing and reacting to the author's (of a poem) use of Language.	1	2	3	4	5
	5.4 Imagery	Learners will be given a SP compatible slide to study imagery. Can they rewrite a poem given (not rich in terms of imagery), inserting figures of speech where necessary?	1	2	3	4	5
		Can they transform a poem into a video rapped song?	1	2	3	4	5

APPENDIX 2

RESEARCHER OBSERVATION SHEET BASED ON BLOOM TAXONOMY

Group Name:

Observer: K.S. Mamugudubi

Learning with a Smart Phone to support Cognitive Dimensions of learning

	Ways SPs can support the cognitive dimensions of learning	YES	Sometimes	Not at all
Remembering (Knowledge)	1. Learning with a Smart Phone assisted learners to recall data or information.			
Understanding (Comprehending)	2. Learning with a Smart Phone assisted them to understand the meaning, translation, interpolation, and interpretation of instructions and problems.			
Applying	3. Learning with a Smart Phone assisted them to apply what was learned in the classroom to novel situations everywhere.			
Analyzing	4. a) Learning with a Smart Phone assisted them to separate materials or concepts into component parts so that its organizational structure may be understood.			
	b) Learning with a Smart Phone assisted them to distinguish between facts and inferences.			
Creating (Synthesizing)	5. a) Learning with a Smart Phone assisted them to build a structure or pattern from diverse elements b) Learning with a Smart Phone assisted them to put parts together to form a whole, with emphasis on creating a new meaning or structure.			
Evaluating	6. Learning with a Smart Phone assisted them to make judgments about the value of ideas or materials.			

APPENDIX 3

INDIVIDUAL SEMI-STRUCTURED INTERVIEW QUESTIONS:

1. a) After having viewed a video clip of a Tshivenda song, are you able to recognise and/or recall events that took place in the clip?
b) Does this makes any difference to the traditional comprehension tests that we are using?
c) Can you elaborate on that?
(Probing; mmm, etc.)
2. a) Does watching a video clip of a poem through your SPs reveal both the verbal and non-verbal techniques (e.g. tone, voice projection/modulation, volume, pace/tempo, phrasing, eye contact, facial expressions, gestures, and body language) for presentations?
b) Is this advantageous than when reading a poem from a book?
c) Why?
(Probing; mmm, etc.)
3. a) Will it be helpful for the learners who feel shy to take video clips - in private - of them presenting a poem or any other task, and then hand them over to the teacher for assessment?
b) What will be the reason for that?
4. a) Drama is all about interaction, movement, voice, staging etc. It is not only about words and language. The manner the play moves is indispensable; how characters interact, what happens when they are not talking; the way body expressions can shift the meaning of a line. Does reproducing a drama in an MP4 video format encourage you to learn story retelling in more pleasant and interesting ways?
b) Does it give you more understanding than when reading it from a book?
c) Clarify.
(Probing; mmm, etc.)
5. a) Did you find it interesting when converting poems into traditional, gospel and rap songs -recorded over your SPs .and shared, through SP Bluetooth feature?
b) Can you, please, explain further?
6. a) Through your SPs, you managed to make talk show recordings which, after listening, you formulated your own recorded debates, small group discussions, and other structured discussion activities. Did you find this having a positive/negative impact (influence) on your language comprehension learning?
b) In which way?
7. a) Can SP recorded audio clips develop your reading and speaking skill?
b) How? (if answer in (a) is yes) or Why? (if answer in (a) is no).
(Probing; mmm, etc.)
8. a) Is it important to accumulate, through your' SPs, recorded audio clips of interviews with your relatives (grandparents, uncles, aunts,) and community elders about histories

and anecdotes relevant to Tshivenda as a language, its people and culture?

b) Why?

(Probing; mmm, etc.)

9. a) “The learning of orals skills through SPs can support efficacious communication and the uses of language in diverse social settings”. Do you agree with this statement?
b) How? (if answer in (a) is yes) or Why? (if answer in (a) is no).
(Probing; mmm, etc.)
10. a) Can your SP assist you in taking and storing pictures allied to an essay, so that they can be used as a mind map for your essay writing?
b) Are you in a position to can infer (conclude) by using pictures to get to the implied meaning of essay main idea?
c) How?
11. a) Photo mind mapping can also be applied on your personal important plans and long term goals. Do you support this statement?
b) Why?
12. With your SPs camera feature, you were in the act of creating reasons, constructing initiations, drawing conclusions, and applying them to the argumentative essay discussions. Did this yield any fruits in your essay writing in particular and comprehending in general?
13. Are you aware that you can snap pictures through your SP camera feature for assignment, field trips and reports?

PDF & PPT.

14. You were given a study guide of the prescribed novel in PDF format (compatible to smart phones), which includes key elements of a prescribed drama book. How was it helpful to you?
15. Was it helpful to receive some notes in PDF format than to copy them in a board or receive manuals which you cannot carry them anytime and anywhere?
16. You were delighted by the fact that their SPs’ PDF and video features played a role in highlighting issues of national importance. How did the two (PDF and video features) enlightened your learning strategy? *(Some said they’ve been hearing from the news about the NDP, but not knowing anything about it, until this experiment. One learner even said she can now deliberate about the matter in a Parliamentary debate).*
17. Are you aware that smartphones also promote a virtual classroom without the panic of electricity supply, video recorder and video viewer, audio recorder and audio listener, and camera and photo viewer?
18. Are you aware that smartphones also promote an interactive (shared) classroom?
19. The experiment shows that you can use your skills to develop and present correct visual and multi-media texts for a variety of purposes. Do you concur with this statement?