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Moodle and blended learning in teaching German for beginners

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Declaration

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Trudie Strauss

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Abstract

The use of technology in teaching is often seen as a d*eus ex machina.* Teachers and parents are quick to identify that the best way to improve teaching is the implementation of technology, by means of a Blended Learning approach. However, little thought is given to the practical considerations of this statement. Reflection on whether the Blended Learning approach can be implemented in the already established teaching practice or whether this necessitates a complete change in teaching methods rarely happens. This study aims to determine whether the incorporation of certain aspects of Blended Learning into an already existing teaching methodology results in a significant change in learners' German performance. Grade 8 beginner German learners took part in this study during the third term of 2014. Two groups were identified: an experimental group and a control group. The experimental group did all homework assignments on the available online learning platform, Moodle, while the control group did homework assignments in the conventional way – on paper. At the end of the third term, learners' examination results were compared to the results of the examination of the second term. The changes in the results of the two groups were compared to determine whether one group manifested a significantly greater change in results than the other. The outcome of the study is that incorporating only elements of a Blended Learning approach into an already existing teaching system, while keeping the methods of instruction constant and only changing the medium of homework delivery, does not have a significant influence on learners' performance in German.

Chapter 1 - Introduction

1.1. Context of Discovery

At a recent strategy meeting at a school in Bloemfontein, groups consisting of members of the school's Governing Body, teachers and parents brainstormed the school's educational strategy. The meeting was divided into sessions and for each session, the groups were asked to provide comments under three headings:

- What can we do better?
- What can we stop?
- What can we start doing? (new)

The first session of this strategy meeting saw the groups brainstorming on how to create a climate for effective education. Figure 1.1 shows the feedback of all the groups for the question: What can we do better to create a climate for effective education? The rating for each group depicts the importance of each comment according to that group. The comments rated as "1 – Most important" for each group, are repeated in Table 1.1.

Figure 1.1: Feedback from Parents, Teachers and Governing Body

	Creating a climate for effective education															
	Group 1	Rating	**Group 2**	Rating	**Group 3**	Rating	**Group 4**	Rating	**Group 5**	Rating	**Group 6**	Rating	**Group 7**	Rating	**Group 8**	Rating
	Can do better		**Can do better**		**Can do better**		**Can do better**		**Can do better**		**Can do better**		**Can do better**		**Can do better**	
i	Staff development	4	Upgrading teachers - upskill - keep teachers up with the times. Do educators have skills for the technology	1	Technology - keep up	1	Maximize technology	1	Maintain holistic balance - Holistic education of learner - all-round saints boy. Re-inforce greeting ritual.	2	Linked by communication. All linked with communication. Computers in classrooms (wifi)	1	Revamp curriculum (CAPS) but there is space for improvement	2	Technology equipment and budget	1
ii	Commitment	2	Re-define school culture - unifying school culture	2	Accountability - as far as learners are concerned - build up a culture where learners take responsibility for their actions	3	Constructive activities learning more constructive	2	Recognition for all.	3	Consistent structures with regards to discipline	3	Improve leadership structure	4	Consistency and control from gr 1 to matric, consistency in everyday work	2
iii	Leadership development for staff and learners	3	Rating system for new school entry admission.	5	Scheduling - during day, week, term	5	Change environment - more conducive. Think out of the box.	5	Parent/teacher communication (boarders) Different communication system - 2 way or 3 way or 4 way system	4	Interaction across the phases. E.g. speak the same language from Gr R - Gr 12	4	Improve teamwork - improve projects	3	Professionalism & intergrity.	3
iv	Introduction of technology	1	Assessment of infrastructure and maintenance plan	3	Professionalism	2	Try lift the bar - pass rate, not just pass but increase quality of the pass.	6	Sesotho 2nd Lang not instituted early enough in early grades - needs to be offered in primary school already.	1	Different strategies for learning. use of technology - e-mailing notes to learners . Access to technology.	2	Improve teaching methods - multiple intelligence.	1		
v	Focus on outdoor education	5	Standardise facilitation methods.		Motivation - for staff and learners , culture to be built up	4	Interactive one on one.	3	Co-ordination with sport - problem with sport - no coaches at fields	5	Learners to take responsibility for their own learning. Realise there are consequences for their actions.	5	Improve parent teacher communication	5		5
									Tapping into internal resources - look within borders of school, what can the community offer.	4						

Table 1.1: Comments Rated "1" by Group

Group	Most important comment
1	Introduction of technology
2	Upgrading teachers - upskill - keep teachers up with the times. Do educators have skills for the technology
3	Technology - keep up
4	Maximize technology
5	Sesotho 2nd Lang not instituted early enough in early grades - needs to be offered in primary school already.
6	Linked by communication. All linked with communication. Computers in classrooms (Wi-Fi)
7	Improve teaching methods - multiple intelligence.
8	Technology equipment and budget

From Table 1.1 it is seen that seven out of eight groups rated a comment relating to the use of technology or computers as most important answer for the question "What can we do better to create a climate for effective education?"

This implies that the perceived need to incorporate technology and computers in our learning and teaching environment exists within schools and educational institutions. However, formulation of this perception is also mostly where it ends. Teachers, parents and members of Governing Bodies have no problem identifying that "we should incorporate technology into our classrooms", but very few consider the practical implications of these statements. Questions like what types of technology, how technology should be incorporated or whether it makes sense incorporating technology in established teaching practice, are rarely the topics of discussion.

For the purposes of this study, the preferred approach to incorporating technology in teaching is, specifically, Blended Learning. It seems that the term Blended Learning has become "somewhat of a buzzword in corporate and higher education settings" (Graham, 2012, p. 4), although it is not always clear what is meant by this term. Many different definitions of this term exist (Graham, 2012, p. 5). For the purposes of this study, Blended

Learning is defined as the combination of teaching face-to-face and teaching with online material.

Still, this definition hardly provides one with an explanation of how the approach should be implemented. It is almost as if this approach is simply seen by teachers as a sort of *deus ex machina* that will solve many teaching problems. Successful studies of blended approaches to teaching, including Sun (2014), Tang (2013), Garrison and Kanuka (2004) and Boyle, et al. (2003), have been published. Tang (2013) summarizes three of the advantages of using blended learning in teaching English as a foreign language: The teacher is able to exploit the advantages of the two separate approaches (classroom learning and online learning) with this "best of both worlds" approach. The blended approach also aids in promoting learners' self-teaching abilities. Through blended learning and the use of multimedia, the teacher is able to enrich the content and make the learning environment more interesting and appealing to the learners (Tang, 2013).

It is therefore assumed that a similar approach will also benefit the teaching situation in our schools. It is crucial, however, to consider current teaching practices within the school, to determine whether implementing a blended learning approach would, in fact, significantly contribute towards a better learning experience.

This study therefore aims to contribute to exploring the practical implications and suggestions of Blended Learning specifically in the teaching of German as a foreign language, within the constraints of an already established teaching practice.

1.2. Considerations in Identifying the Research Questions

When identifying the exact research question for this research paper, four factors are considered.

In the first place, it is important to bear in mind that this study takes place within an already existing teaching practice. This paper does not introduce an entire new approach to teaching nor does it propose a paradigm shift away from the current teaching practice. Rather, this research suggests that changes in teaching methods can occur within an established system.

Secondly, the exact definition of Blended Learning used in the research should be determined. Many different definitions of this term exist. Graham (2012, p. 5) explains three ways of

defining Blended Learning. These definitions are: the combination of teaching modalities, the combination of teaching methods, and the combination of face-to-face and online teaching. For the purposes of this study, the third definition is used. Carman (2005) identifies five key elements in the design of a Blended Learning approach. Not all of these elements, however, are used for the purposes of this study, as the methods are implemented into an already existing practice, and not as an approach on its own. The elements defined by Carman (2005, p. 3) and used in this study are: online content, assessment and reference materials.

The time frame assigned to a research study is also an important factor to be taken into account when identifying the research question. When one aims to observe the effect of big changes on a learning plan, the time apportioned to that study should be much more than when the aim is to observe the influence of small incorporated changes. Since this study is considered a short-term study and is conducted over a period of one school term, drastic changes cannot be implemented. This is why this research is focused on the enhancement of the current teaching system with only certain elements of blended learning.

Lastly, it is imperative that results be analysed in a statistically accountable manner. Comparative studies seldom feature in educational research. In many cases, results are compared to results of previous years or results at other schools. In these cases there are many other variables that are not taken into account and that may bias the results. The researcher has a strong statistical background and aims to ensure that this paper includes a thorough statistical study in a controlled environment over a short term where the effect of other variables is minimised.

1.3. Research Question

Taking the factors mentioned above into account, the question is asked whether the incorporation of selected aspects of blended learning would result in a significant change in learners' German performance when no changes are brought to bear upon the already existing teaching methodology.

Since the short-term nature of this study does not allow for drastic changes to be implemented, this research only focuses on the implementation of one aspect of blended learning, in this case an online learning management system, into the existing teaching methodology.

The aim of this study is not to compare two learning theories, but to establish whether the use of an aspect of blended learning can enhance existing teaching methods.

Chapter 2 - Literature Study

In this chapter the discussion is centred on three relevant theoretical positions on learning: behaviourism, cognitivism and constructivism. Against the background of these three views, theories in the field of Second Language Acquisition (SLA) research and theories of language learning are discussed. The discussions of technology in language instruction, and instructional design are also based on the theoretical views of behaviourism, cognitivism and constructivism. A section is dedicated to elaborate on the current state of German as a foreign language in South Africa. Finally, the role of each of these three theories in an e-learning system is discussed.

2.1. Second Language Acquisition

2.1.1. Introduction and definition

The field of Second Language Acquisition (SLA) research is a subfield of Applied Linguistics (Ortega, 2011, p. 171) that studies the process of how additional languages are learnt or lost (Doughty & Long, 2003, p. 3). The field of SLA has been described as "a complex multifaceted phenomenon" (Ellis, 1994, p. 15). Kramsch (2000) elaborates on the "confusion about the nature of SLA as a domain of research" (Kramsch, 2000, p. 311) and compares three different definitions of SLA. The first definition describes SLA as research with the primary goal of building "a theory of how second linguistic systems develop within individual learners" (Kramsch, 2000, p. 314). This definition is echoed in VanPatten and Benati (2010, p. 1) where the authors argue that the focus of SLA is on "learners and learning rather than teachers and teaching." This definition is further substantiated by Ortega (2011, p. 171) where SLA is described as an investigation of the "human capacity to learn additional languages during late childhood, adolescence, or adulthood".

The second definition provided by Kramsch (2000) states that SLA research does not only include the internal processes of the learner, but also encompasses the teacher's methods and the learning environment. In the third definition "SLA research not only strives to explain basic and applied SLA phenomena, it also encompasses societal concerns and the role that language learning, including ESL, plays in multicultural societies" (Kramsch, 2000, p. 314).

Several authors, such as VanPatten and Benati (2010) and Ortega (2011) agree on the first definition as given by Kramsch (2000), that SLA research is devoted to the study of learners

and learning processes of additional languages. The findings of SLA research, however, should not be disregarded by teachers (VanPatten & Benati, 2010, p. 2) and it is possible – as stated in the second definition given by Kramsch (2000) – to apply these findings to language teaching. The application of SLA findings to language teaching is discussed later in this section.

It is worth noting that the term SLA in this paper also refers to foreign language acquisition, and that – for the purposes of this study – a second language or L2 is an umbrella term for third languages, fourth languages, or any other language learned after the first language (L1). VanPatten and Benati (2010, p. 1) argue that, although there are sociological differences between learning an additional language which is also spoken in the environment outside the classroom and learning a foreign language (*e.g.* German in South Africa), the mechanisms for language learning remain constant. In other words, the inherent processes involved in the acquisition of a second language do not depend on the context. "The mind/brain still has to do what it has to do whether instruction in language is present or not, and whether there is presence or absence of opportunity to interact with speakers of the language." (VanPatten & Benati, 2010, pp. 1,2) The term second language acquisition refers to the acquisition of the "additional language after the first language or languages have been learned in life" (Ortega, 2011, p. 181).

A brief overview of the history and some of the theories of SLA research is now provided.

2.1.2. History and theories in SLA research

The study field of SLA as a research discipline was conceptualised around the 1960s and 1970s (Ellis, 1994, p. 1), as a fusion of fields in language teaching, psychology and linguistics (Hulstijn, 2007; Doughty & Long, 2003, p. 3). VanPatten and Williams (2007) explain that many different theories of SLA exist, mainly because the perspectives of the researchers differ (VanPatten & Williams, 2007, p. vii) and that multiple theories might even complement each other to explain different phenomena in SLA. In the following section, some of the theories of SLA are discussed.

The two theories identified to have a fundamental impact on SLA before the 1990s were behaviourism and Krashen's Monitor Theory (VanPatten & Williams, 2007, p. 17).

Behaviourism is a psychological theory of human and animal behaviour. Many believe that this theory originated in experiments of Pavlov with dogs. These experiments consisted of

particular sounds made whenever the dogs were fed. After some time the dogs salivated whenever they heard these sounds – even when no food accompanied the sounds. This concept of stimulus (the sound) and response (the salivating) was known as classical conditioning.

The theory of behaviourism is rooted in these concepts of stimulus and response. Behaviourists believed that human behaviour would follow the same pattern. If a particular response is made to stimulus repeatedly, their connection is strengthened and this establishes the development of new behaviours.

This theory was borrowed from psychology to "account for both first and second language acquisition, and by the use of structural descriptions of language" (VanPatten & Williams, 2007, p. 17). It implies that all learning, including the learning or acquisition of a language, was seen as "the acquisition of a new behaviour" (VanPatten & Williams, 2007, p. 19) or as the formation of a habit (Mitchell & Myles, 2004, p. 30) and that the environment in which the new language is learned is the most crucial factor in learning.

The behaviourism theory was also linked to structural linguistics, an approach that originated from the work *Course in General Linguistics* by Ferdinand de Saussure in which he posited that language is based on a "closed system of elements and rules that could be described quite independently from the psychological subjectivity of any particular user of that language" (Radford & Radford, 2005). In other words, structural linguistics should be seen as a study to describe the language (expressed as a finite set of predictable patterns) and not to explain why the language functions the way it does. Because of the view of language as "based on a discrete and finite set of patterns" (VanPatten & Williams, 2007, p. 20), this theory was easily merged with behaviourism, in which learning is viewed as a "discrete set of behaviours" (VanPatten & Williams, 2007, p. 20).

Because behaviourism implies that learning a new language is simply the acquisition of a new set of habits, the theory argues that the L1 habits might interfere with the L2 acquisition. The construct of Transfer (a construct rooted in behaviourism, where L1 habits were used in attempts to produce the L2) was identified as the reason why learners were not always successful in L2 acquisition. Transfer could, however, also have a positive influence in the L2. The influence of the transfer depended on the 'distance' or difference between the languages. Contrastive Analysis consisted of finding the difference between the first and

second languages and thereby determining how difficult learning the second language should be (Mitchell & Myles, 2004, p. 32; VanPatten & Williams, 2007, p. 21). When the L1 and L2 were different from each other, the transfer of L1 habits in L2 production would have a negative effect, but if the languages were similar, the learner could use some of his/her L1 habits in L2 production, and the transfer would be positive.

VanPatten and Benati (2010, p. 2), Ortega (2011, p. 172) and VanPatten and Williams (2007) mention two very influential works which, the authors argue, laid the foundation of the field of SLA research. The first work is 'The Significance of Learners' Errors' by SP Corder in 1967. In his work, Corder suggests that the errors that learners of second languages make indicate that they are learning – and how they are learning the second language (Corder, 1967). He also suggests that learners use the knowledge of their first language when acquiring a second language and with this view he disregards the theory of behaviourism theories in SLA (VanPatten & Benati, 2010, p. 2).

The second significant work on which SLA is based is the paper of Larry Selinker 'Interlanguage' published in 1972. This paper suggests that learners, while using the knowledge of their mother tongue, construct an interim grammar (an Interlanguage) when learning a new language. This Interlanguage is influenced by both the native language and the target language (Selinker, 1972).

Based on the works of Corder and Selinker, the SLA research field expanded and gained more and diverging approaches within the one field over the next few decades. The 1970s saw, according to VanPatten and Benati (2010, p. 3), the emergence of studies that moved away from the theory of behaviourism. The behaviourist view was replaced by a "novel conceptualization of acquisition as creative construct" (Ortega, 2011, p. 172). SLA research replicated findings from first language (L1) acquisition research. During this period research focused on the actual language produced by learners (Ortega, 2011, p. 172) and, through this, the concept of error analysis, a detailed investigation of the errors made by L2 learners, was brought about (VanPatten & Benati, 2010, p. 3; Ortega, 2011, p. 172).

During the 1970s and early 1980s research in SLA was introduced to what was known as Krashen's Monitor Model (VanPatten & Benati, 2010, p. 3) . The view of Krashen was that "L2 acquisition occurs within dimensions defined largely by input and affect and operating mostly on an unconscious level" (Ortega, 2011, p. 173). Although not explicitly stated in Krashen's

work, there seems to be a connection with Chomsky's language theory. Chomsky strongly argued against the behaviourist theory and stated that humans have an "abstract and hidden representation of language knowledge held inside our minds" (Mitchell & Myles, 2004, p. 10) and that learning a language is therefore different from acquiring other skills. Strauss (2009, p. 328) explains Chomsky's claim that "an a priori element is inherent in the faculty of language-acquisition" (Strauss, 2009, p. 328). The acquisition of a first language, according to Chomsky, does not occur solely through an empirical process. Rather, the child masters the grammatical structure and linguistic rules with an incomplete set of linguistic data, without any direct instruction, and sometimes, without actively participating in talking activities. Strauss (2009, p. 328) argues that, "even if the linguistic experience to which the child is exposed is not only limited but also largely degenerate, the child nonetheless masters the principles and rules governing the formation of meaningful sentences and the interpretation of linguistic utterances" (Strauss, 2009, p. 328).

Furthermore, when the learning of a language is compared to the mastering of a complex scientific theory, it seems obvious that the level of intelligence plays a significant role in the latter. However, Strauss argues that the differences in linguistic competence, due to difference intelligence, are negligible (Strauss, 2009, p. 328).

Strauss (2009, p. 328) summarises that "once the basic linguistic competency is mastered the child can creatively generate meaningful sentences never heard before – ruling out any idea that language merely emerges through acts of imitating what is heard." (Strauss, 2009, p. 328)

Krashen's Monitor Theory seems to bear a connection to Chomsky's theory of language (VanPatten & Williams, 2007, p. 25). Monitor Theory grounds the acquisition of a language on the following: the learner should be able to understand meaningful messages, and the linguistic information contained in those messages should interact with that faculty of language-acquisition as mentioned by Strauss (2009, p. 327).

"According to Krashen, Monitor Theory can explain why what is taught is not always learned, why what is learned may not have been taught, and how individual differences among learners and learning contexts is related to the variable outcome of SLA" (VanPatten & Williams, 2007, pp. 25,26). To explain these phenomena, Krashen identified the following five connected hypotheses within his Monitor Theory.

The Acquisition-Learning Hypothesis

Krashen makes the distinction between learning and acquisition of a language, and suggests that knowledge gained through learning and knowledge gained through acquisition are stored separately. Acquisition is defined as a subconscious process – when, for example, talking to a native speaker in the L2. Acquisition occurs spontaneously without instruction, or even the intent to learn. Learning is the conscious effort made to master the rules of the language. VanPatten and Williams (2007, p. 26) suggest that this usually occurs when the language of instruction is not the L2, i.e. when the medium of instruction is different from the language being taught. This is often the case in foreign language teaching – the principles and structures of the target language are explained to the learners in their home language.

This hypothesis has been subject to considerable controversy, especially because Krashen claims that these two constructs, learning and acquisition, can never interact. However, the following hypothesis is how Krashen aims to explain why learners can learn something they were never taught, and why they might be unable to learn something that they were taught.

The Monitor Hypothesis

The Monitor Hypothesis posits that learned language is only useful to 'monitor' or edit acquired language during L2 production. Learners can use this monitor when they are required to pay attention to form rather than meaning, and when they have sufficient time.

McLaughlin's (1978) criticisim on this hypothesis is that – because the 'monitor' construct of learning is only required to edit L2 production – this hypothesis completely negates the importance of comprehension in learning. Krashen ignores "the role that monitoring playis in the reception of language" (Bahrani, 2011, p. 283).

The Natural Order Hypothesis

Research in language acquisition has shown that the acquisition of grammatical structure occurs in a specific sequence – regardless of the first language (VanPatten & Williams, 2007, p. 27). This has been used as evidence for the natural order hypothesis in Monitor Theory and Monitor Theory suggests that the pattern is regulated because of the guidance by the innate language acquisition faculty, as documented by Chomsky.

The Input Hypothesis

As mentioned previously, the notion of Monitor Theory is based on the learner understanding meaningful messages. The input hypothesis suggests that the input or message the learner receives should be an increment higher than the level at which he/she is able to produce the L2.

The criticism of this hypothesis is based mostly on the fact that Krashen does not explain how these increments work, and how they can be measured. The vagueness of the definition of these increments, negatively influence the testability of this hypothesis. "By proposing concepts while refusing to operationalize them, Krashen makes it impossible for researchers to test their reality and usefulness" (Cowan, 2008, p. 30).

The Affective Filter Hypothesis

This hypothesis describes factors that can play a role in SLA. These factors include motivation, self-confidence and anxiety (Bahrani, 2011). The claim of this hypothesis is that learners who are motivated, comfortable and have a positive attitude towards the language will process the input more easily, whereas anxious learners in a stressful environment tend to block the input by raising the 'affective filter' as Krashen calls it. Similar to critique on the Input Hypothesis, the Affective Filter Hypothesis is also criticised for its non-testability (Bahrani, 2011). Krashen also identifies the Affective Filter to manifest only at the onset of puberty, but fails to mention why and how this filter develops. (Bahrani, 2011). Furthermore, Krashen does not explain how the filter determines which parts of, e.g. language are let through the filter. The question of how the effect of this hypothesis on interlanguage development may be determined, is also not explained (Zafar, 2009). Zafar (2009) argues that Krashen promotes "a filter without specifying its nature and the tools required for assessing its particular strengths and weaknesses" (Zafar, 2009, p. 145).

Despite the extensive criticism to which Monitor Theory was subject since the 1980s (VanPatten & Benati, 2010, p. 3; VanPatten & Williams, 2007, p. 32; Bahrani, 2011), there is no doubt that Krashen's Monitor Theory has had a great influence on SLA research and L2 teaching (VanPatten & Williams, 2007, p. 25; Bahrani, 2011).

The theory of behaviourism and Monitor Theory both played important roles in the development of SLA as a research field and SLA theories since the 1990s. During the 1990s the field of SLA research expanded and many different theories and approaches were

developed and tested. VanPatten and Benati (2010, p. 4) and Ortega (2011, p. 173), argue that there were two approaches leading the field of SLA research by the end of the 1990s: "the application of linguistic theory and the application of certain psychological approaches" (VanPatten & Benati, 2010, p. 4). Hulstijn (2007) substantiated this view, indicating that a significant amount of literature in SLA research is based on either of these two approaches. Chapelle (2009), classified the theoretical perspectives into four approaches:

- Cognitive linguistic approaches (Universal Grammar theory, Autonomous induction theory, and the concept-oriented approach)
- Psycholinguistic approaches (Processability theory, Input processing theory and interactionist theory)
- Human learning approaches (Associative-cognitive CREED theory and Skill acquisition theory)
- Language in social context approaches (Sociocultural, socialization, conversation analysis, systemic functional and complexity theory)

In the following section, some of the cognitive linguistic approaches are explained very briefly, largely based on chapters in the volume by VanPatten and Williams (2007). The psycholinguistic, human learning and language in social context approaches will be referred to in the section on how the theories implicate Computer-Assisted Language Learning.

The application of linguistic approaches in SLA stems from views expressed by Chomsky (White, 2003, p. 20) and "seeks to describe the linguistic knowledge (competence) of L2 learners at initial, intermediate and end stages of L2 development, as mediated by Universal Grammar, taking the influence of previously learned languages into account" (Hulstijn, 2007, p. 197).

The concept of Universal Grammar (UG) was conceived on the basis of Chomsky's views on language acquisition. This theory claims that human beings have at their disposal a "natural language system that can be described in terms of linguistic rules and principles" (White, 2003, p. 19). In other words, the theory of UG claims that learners know much more than the input they receive, because "all human beings inherit a universal set of principles and parameters that control the shape human languages can take" (Mitchell & Myles, 2004, p. 54). UG therefore suggests that, in the case of L1 acquisition, the child brings to the task

inherent knowledge of certain constraints in the language. The child knows that certain sentence structures are not correct, without having been explicitly taught this. White (2003) suggests that the same phenomenon can be observed for L2 acquisition, when learners seem to know more than what they were taught, but that this phenomenon is different from L1 acquisition, because in L2 acquisition, the learner already possesses knowledge of the L1 grammar. Therefore, 'Interlanguage', the term coined by Larry Selinker in 1972 and briefly mentioned earlier, also plays a role in L2 acquisition. Interlanguage is the term used for the language used by the learner, comprising of knowledge from his mother tongue (L1), as well as knowledge he has gained from the target language (L2). The theory of UG suggests that interlanguage competence must be subject to the same constraints as the L1 competence and that UG is implicated in L2 acquisition as well.

The theory of UG has been widely used as foundation of or explanation in other theories, such as Autonomous Induction theory.

Autonomous Induction theory (AIT) utilizes the view of UG to explain the poverty of the stimulus problem, *i.e.* how it is that learners possess knowledge of language structures that they were never explicitly taught (Carroll, 2007; Hulstijn, 2007). AIT posits that this knowledge learners possess, can be attributed to a psychological mechanism, the Language Acquisition Device (LAD) and that the UG is "manifested implicitly in the operations of LAD" (Carroll, 2007).

The concept-oriented approach is a functional approach to second language acquisition. Functionalist approaches claim that the primary uses for language is to communicate and convey meaning (Bardovi-Harlig, 2007). Bardovi-Harlig (2007) therefore explains that this concept-oriented approach focuses on function-to-form mapping. The concept-oriented approach aims to examine how learners express a certain concept, like futurity or plurality. This approach is not concerned with whether the learners are correct or incorrect in terms of grammatical rules of the target language, but this approach rather aims to perceive how the concept is expressed and how this expression changes over time as the language is acquired. This approach is concerned with the interlanguage of the learners. Bardovi-Harlig (2007, p. 70) emphasises the importance of "exploring the emergence, interplay, and balance of features of the interlangauge as a linguistic system" (Bardovi-Harlig, 2007, p. 70), rather than focusing on the distance between a learner's interlanguage and the target language. This

approach has contributed to research in explaining "stages of acquisition, variable outcomes, influence of first langauge, and the effects of instruction" (Bardovi-Harlig, 2007, p. 68).

In the next subsection a brief overview of the fundamental issues and themes in SLA research is provided. These issues are significant across all theories of SLA research.

2.1.3. What SLA research entails: Overarching questions in SLA

Ortega (2011, p. 171) summarizes the essence of SLA research, as the aim to answer the following over-arching questions:

1. How are second or additional languages learned after the acquisition of a first language?
2. What are the differences and similarities between the acquisition of a first language and the learning of an additional language?
3. Why do the outcomes of second language learning differ amongst learners?
4. What is needed to successfully acquire a new language at a later age than the first language?

Ortega (2011) encapsulates the research of the SLA field into these four questions. There are many other key issues and themes that have emerged since the dawn of SLA as a research discipline. These key issues are of significance for all SLA researchers, regardless of the different schools to which they adhere, as discussed in the previous subsection. Hulstijn (2007) argues that the researchers in the different schools might benefit from each other's work, because "all SLA topics, albeit often indirectly, are ultimately concerned with the way in which the mind/brain of the L2 learner represents and processes linguistic information" (Hulstijn, 2007, p. 191).

Hulstijn (2007) gives an overview of what he sees as the eight fundamental issues in SLA research. VanPatten and Benati (2010) also provide a list of nine key issues, and Ortega (2011) summarises the fundamental issues in five key themes.

All authors agree that one of the most important questions in SLA research is whether the age of the learner plays a part in the learning of a second language, *i.e.* whether there is a critical period for successfully learning a second language. Hulstijn (2007) describes that the presence or absence of a critical period should be explained and that this explanation leads to the

identification of biological and socio-psychological factors that influence language learning. Hulstijn (2007) refers to the study of Hyltenstam and Abrahamsson (2003). Hyltenstam and Abrahamsson (2003) base their findings on theoretic and empirical literature and observe that maturation has a strong influence on second language acquisition, and that adult learners will possibly not attain the same native like proficiency as children. They therefore conclude that there is a critical period for language learning. Moreover, the authors explain that biological and socio-psychological factors play a role both during and after the critical period. Hulstijn summarises their findings: "While biological factors play a more important role than socio-psychological factors in the critical period, socio-psychological factors play a more important role than biological factors after the critical period" (Hulstijn, 2007, p. 194). Another important issue raised in SLA research is the difference between individual learners, and how second language learning is influenced by these differences (Mitchell & Myles, 2004, p. 25; Ortega, 2011, p. 178). This issue is linked to the issue of what learners bring with them when starting to learn a new language: Do they use knowledge from L1 learning? And if so what are the cross-linguistic influences (Ortega, 2011, p. 176; Mitchell & Myles, 2004, p. 19)? Hulstijn (2007) identified another important issue regarding what mechanisms learners use to acquire a second language. This refers to how the learners learn a new language, whether it happens in the same way as learning to cook, or whether learning a language is a unique process. A question that also surfaces in much of the literature is whether it is possible for L2 learners to become native-like speakers of the foreign language (VanPatten & Benati, 2010).

It is of course also important to consider the different external factors that influence SLA in different environments (Mitchell & Myles, 2004, pp. 25,26; Ortega, 2011, pp. 177,178; Hulstijn, 2007). These factors refer to the community or environment in which the second language is learned and also the role instruction plays in learning a second language (Mitchell & Myles, 2004, p. 28; Ortega, 2011, p. 179). Expanding on the topic of the role of instruction in the acquisition of a foreign language, the next section elaborates on how SLA research influences classroom teaching and to what extent SLA research findings can be applicable in language teaching classrooms.

2.1.4. SLA research and its application on language teaching in the classroom

There have been many debates on how applicable SLA research is in terms of language teaching – to such an extent that an entire new field of SLA research has begun to see the

light: Classroom SLA research (Lightbown, 2000). In Lightbown (1985) the author already suggested that teaching languages could benefit from the SLA research, but it was only in Lightbown (2000), after 15 years of expanding SLA research, that the author aims to indicate to which extent SLA research could influence language pedagogy. Lightbown (2000), however, still indicates that findings in SLA research should be applied cautiously. Most researchers have noted that teachers – although interested in some of the SLA findings, mostly rely on their own experience for finding the 'best' teaching method. (Lightbown, 2000; Nassaji, 2012). This makes sense, because the theoretical findings of SLA research are not always universally applicable to every situation (Mitchell & Myles, 2004, p. 261). Many teachers also do not have time to keep themselves updated on the most recent significant scientific findings and have also indicated that some of the findings are too scientific and difficult to understand (Nassaji, 2012). Nassaji (2012), therefore, makes a number of suggestions for teachers and researchers in SLA to collaborate and contribute to each other's work. However, it still seems at this stage that a gap exists between language teaching and the field of SLA research (Hatasa, 2013). Chapelle (2009) argues that this gap primarily exists between language instruction and the SLA theory concerned with generative linguistics, *i.e.* SLA seen as a "natural phenomenon unaffected by instruction" (Chapelle, 2009, p. 742). However, when it comes to the development of teaching materials, SLA theories influencing instruction have expanded extensively from the theory of generative linguistics (Ortega, 2005).

2.2. Teaching Theories

In this section, the three central theories of behaviourism, cognitivism, and constructivism are mentioned again, this time, not as theories of SLA, but of learning in general. These three theories are discussed to determine which of these aids in explaining the processes involved in the learning environments used in this study.

These theories provide support in achieving three goals:

- Identifying the design of the online learning platform, Moodle,
- Identifying the design of the learning environment in already established teaching practice, and
- Should there be a difference in the designs, determine whether these two learning environments are compatible.

Later in this chapter, the first goal is discussed and the learning environment Moodle is identified according to one of these theories. The second and third goals are discussed in Chapter 3 where an overview of the current teaching practice at Grey College is given. A discussion then follows concerning the difference in theories underlying the learning environments, and a conclusion is drawn regarding compatibility between these two learning environments.

The three theories are defined briefly and an overview is given on how each theory influences the design of the instructional materials, and what the role of the teacher is within the framework of each theory. Ertmer and Newby (Ertmer & Newby, 2013) discuss these three theories of learning and how they affect instruction.

Behaviourism

The behaviourist view on learning is that "learning is accomplished when a proper response is demonstrated following the presentation of a specific environmental stimulus" (Ertmer & Newby, 2013, p. 48).

Ertmer and Newby (2013) identify the principles underlying instructional design within a behaviourist view of learning:

- Measurable outcomes are produced.
- Learners are assessed before commencing with the course to determine what knowledge they bring to the task and where instruction should begin.
- Early steps should be mastered before learners can progress to more complex performance levels.
- Performance is influenced by the use of reinforcement such as rewards and positive feedback.
- To facilitate the stimulus-response association, cues and repetitive practice are used.

In the behaviourist view, the job of the teacher is three-fold. The teacher should, firstly, identify cues that prompt certain responses, secondly, provide an environment where learners can practice associating these prompts with the stimuli they represent, and, thirdly, the teacher should provide the learners with possibilities of making the correct responses to the stimuli, and be rewarded for the responses.

Cognitivism

Cognitive theories "focus on the conceptualisation of students' learning processes and address the issues of how information is received, organized, stored, and retrieved by the mind" (Ertmer & Newby, 2013, p. 53).

Within the cognitivist view, the following assumptions are made regarding instructional design:

- Learners are actively involved in the learning process.
- Lessons are built upon prerequisite lessons.
- Information is structured, organised and sequenced to "facilitate optimal processing" (Ertmer & Newby, 2013, p. 53).
- Learning environments are created "that allow and encourage students to make connections with previously learned material" (Ertmer & Newby, 2013, p. 53).

"Cognitive theories emphasize making knowledge meaningful and helping learners organize and relate new information into existing knowledge in memory" (Ertmer & Newby, 2013, p. 53). Within this view, the teacher should recognise the differences in learners' previous learning experiences, and effectively stimulate the previously acquired knowledge in the learners. The teacher should further create an environment where learners can practice with feedback "so that the new information is effectively and efficiently assimilated and/or accommodated within the learners' cognitive structure" (Ertmer & Newby, 2013, p. 54).

Constructivism

Within the constructivist view, learning is understood as "creating meaning from experience" (Ertmer & Newby, 2013, p. 55), since humans "create meaning as opposed to acquiring it" (Ertmer & Newby, 2013, p. 55).

Ertmer and Newby (2013) identify the principles underlying instructional design within a constructivist view of learning:

- The context in which skills are learned and applied should be identified and emphasised.
- Learners are expected to be able to manipulate information and apply this information to situations other than those in which they received instruction.

- The same content is presented in different contexts.

- Learners are expected to think further than what they have been taught.

- Skills are transferred to situations that differ from the initial instruction.

The teacher, in the constructivist view, has the tasks ”(1) to instruct the student on how to construct meaning, as well as how to effectively monitor, evaluate, and update those constructions; and (2) to align and design experiences for the learner so that authentic, relevant contexts can be experienced” (Ertmer & Newby, 2013, p. 59).

Ertmer and Newby (2013) further discuss which of these theories “is the most effective in fostering mastery of specific tasks by specific learners” (Ertmer & Newby, 2013, p. 61). They suggest that the proficiency level of learners and the level of cognitive processing required in the learning content should be determined before deciding on an approach.

Three stages of knowledge acquisition are described by Jonassen (1991): introductory, advanced and expert. “Jonassen agrees that introductory knowledge acquisition is better supported by more objectivistic approaches (behavioural and/or cognitive) but suggests a transition to constructivist approaches as learners acquire more language” (Ertmer & Newby, 2013, p. 57).

The suggestion is therefore that for tasks that require a low level of cognitive processing, and where learners are in the beginning stages of knowledge acquisition in a field, the behaviourist approach to teaching is appropriate. Where more cognitive processing and problem-solving are required, and learners possess a higher level of knowledge, constructive learning environments are more effective.

Since this paper of Ertmer and Newby had already been written and published in 1993, Ertmer and Newby (2013) contains an update. The authors describe how the constructivist position on learning has “become the foundation for the majority of teaching methods that have taken hold in recent years” (Ertmer & Newby, 2013, p. 67). Still, they argue that the theories discussed twenty years before remain relevant. “People still learn through stimulus-response associations […] and through practice and feedback opportunities […] as well as through the processes of collaboration and social negotiation” (Ertmer & Newby, 2013, p. 69). It is therefore still considered important to identify the learning theory used in a school setting, before continuing with the process of instructional design.

2.3. Language Instruction with Technology

2.3.1. Bridging the Gap between SLA Research and Language Instruction

Chapelle (2009) bases her study on the work of Garett (1991) and considers different SLA theories and their influence on the development of learning materials, especially with regards to Computer Assisted Language Learning (CALL). Chapelle (2009) distinguishes four theoretical approaches in SLA theory and discuss their influence on CALL. Through this she is able to establish a connection between SLA research and its practical application to classroom teaching, focusing primarily on CALL.

The four approaches considered by Chapelle (2009) are: "cognitive linguistic (Universal Grammar, autonomous induction theory, and the concept-oriented approach); psycholinguistic (processability theory, input processing theory, interactionist theory); human learning (associative–cognitive CREED, skill acquisition theory); and language in social context (sociocultural, language socialization, conversation analysis, systemic–functional, complexity theory)" Chapelle (2009, p. 741). In her study, Chapelle (2009, p. 744) also provides a table with examples of what the implication of each theory is on CALL.

Cognitive linguistic perspectives "are concerned with the learners' internal mechanisms responsible for linguistic development" (Chapelle, 2009, p. 743). These theories imply that the effects of instruction are limited to what the learners themselves are capable; these theories are also focused on individualised instruction, and in particular also the sequence of language acquisition. Chapelle (2009) suggests that the implication of these theories on CALL is that the curriculum is largely grammatically based, where learners investigate grammatical patterns, to test their own hypotheses (Garret, 1991, p. 92).

From the psycholinguistic perspectives such as input processing and interactionist theories, it is important to note how learners process the second language input, in a way that makes sense to them, to essentially create their own interlanguage. These approaches have a specific implication on the design of CALL materials, as they are concerned with "how input is presented and used for interaction" (Chapelle, 2009, p. 746).

The general human learning approach suggests learning methods concerned with repeated exposure. From this perspective tasks in CALL "would be designed in such a way as to provide

learners with optimal amounts and circumstances of exposure to the targeted linguistic areas to be learned" (Chapelle, 2009, p. 747).

As a different point of view, the approach of language in social context is also considered. This approach differs from the other theoretical approaches in that the social context is also taken into consideration. With use of the internet and mobile technologies expanding rapidly, this approach is very valuable to teaching. The implications of this approach involve communicating with native language speakers, or learning more about the cultural background of the foreign language being learnt.

2.3.2. Moodle as an Online Learning Platform for Language Learning

MOODLE is an acronym for Modular Object-Oriented Dynamic Learning Environment (Brandl, 2005), developed by Martin Dougiamas and first released on 20 August 2002 (Moodle Pty Ltd, 2014). Moodle is a Learning Management System (LMS) that is free of charge, and is maintained by a group of programmers and the user community (Brandl, 2005; Stanford, 2009, p. 7).

Kumar, et al. (2011) compared Moodle to Blackboard[TM], WebCT[TM] and other learning management systems and found Moodle to be one of the better options when considering learning management systems. One of the most important reasons that Moodle is considered rather than Blackboard[TM] or WebCT[TM], is the fact that there are no licensing costs involved with Moodle (Kumar, et al., 2011; Brandl, 2005). Kumar et al. (2011) also highlighted many aspects of Moodle that distinguishes it from its counterparts. The available learner tools, administrative and support tools, architecture and technical specifications combined with the fact that it is free of charge, shows why Moodle is the preferred choice as LMS for many institutions and organisations. The fact that Moodle is Open Source software, meaning that it can be downloaded and modified freely, and the fact that there is a large community of programmers, developers and other Moodle users as support contribute to the advantages that Moodle has over, e.g. Blackboard[TM] or WebCT[TM].

Moodle provides teachers with the means to develop their own assignments, quizzes or exercises. These materials are then accessible to the learners online, and can be accessed from anywhere. As Moodle is device-independent, the learner is able to access his/her Moodle content on any computer, tablet or smartphone.

Literature on the use of Moodle is abundantly available. The Moodle website contains basic instructions and documents on Moodle use for teachers and developers and also a list of available books on Moodle (Moodle Pty Ltd, 2014). Authors such as Stanford (2009) and Brandl (2005) have focused their work on Moodle specifically in foreign or second language teaching.

An overview of recent research done on the implementation of Moodle in language learning follows. An outline of the technical features of Moodle as suggested by Brandl (2005) and Stanford (2009) is given in Chapter 5, where the development of teaching materials is discussed.

A recent study by Sun (2014) investigates the use of blended learning in college English with Moodle as an online learning platform. In this study the author aims to show empirically that implementing blended learning in teaching English as a foreign language in China not only improves student's knowledge and skills in the language, but also their behaviour and attitude towards the language (Sun, 2014).

Sun (2014) suggested the use of Kirkpatrick's four level evaluation model. Although the author mentions that this model has been subject to criticism, she also states that a better model has yet to be introduced. The four levels of this model are: reaction (how learners feel about the teaching method), learning (how their skills and knowledge have been improved), behaviour (how their attitudes were affected by the teaching method), and results (the effects the training method has had on their environment, resulting from their performance).

Ninety second-year students (80 males and 10 females) from a Jilin higher education institution in China participated in this study. The participants had already passed their first year of English as a foreign language, and, therefore, already had a foundation in the language. To establish statistical similarity between the control group and the experimental group, the 45 students in each group wrote a proficiency test, and answered questionnaires before the implementation of the blended learning program, and this showed that there was no significant difference between the results of the two groups in the proficiency test.

The blended learning method was implemented during the course of 15 weeks in a semester. The control group was only exposed to face to face training throughout these 15 weeks, whereas the experimental group received face to face teaching half of the time and had to

spend the other half of the contact hours online, participating in discussion groups, completing quizzes, and submitting assignments online.

At the end of the implementation period, all the students were asked to complete the same questionnaire that they completed before the study commenced, and all of the students then wrote another proficiency test. The test was different from the test before the study, but was standardized to adjust for new concepts learned during the 15 weeks.

After the implementation period an interview was conducted with the lecturers and some of the students from the experimental group. This was counted as qualitative results for the study.

The quantitative results from the study (the difference between the responses on the questionnaires, and the results from the proficiency tests) were analysed statistically. It was shown from the quantitative and qualitative data that the implementation of a blended learning program had a positive influence on the student's proficiency, learning attitudes and learning skills.

The qualitative feedback was also mostly positive. The lecturers mentioned that the blended learning programme put extra pressure on them, as they had to master the Moodle system and prepare more content before the lectures. However, most of the feedback was positive and Sun (2014) thereby showed that the implementation of a blended learning system in language teaching was favourable.

A question Sun (2014) poses is how one can "involve those learners whose English level is too low to participate in B-learning" (Sun, 2014: 93). The learners involved in this study have no background in learning German, and this is also a limiting factor for the use of a blended approach. The study by Sun (2014) is, however, very relevant to this research, as it involves the implementation of Moodle into language teaching. In the case of Sun (2014 the methods of teaching differ between the groups. As this study is concerned with school children and not students, it would not be practical to change the methods of teaching. For the purposes of this study only the submission of assignments differs for the two groups.

2.3.3. Identifying Moodle using One of Three Central Learning Theories

After considering the characteristics mentioned above for the three central theories of behaviourism, cognitivism, and constructivism, it is not difficult to identify that tendencies of constructivism are most prominent in the learning environment Moodle provides.

Stanford (2009) explains that "constructivism is based on the idea that individuals learn new things (construct knowledge) through experience by comparing new things to what they already know. They do this by solving realistic problems, often in collaboration with other people. Moodle was built on this approach, and many of the core activities lend themselves well to this type of learning" (Stanford, 2009, p. 9). These core activities include wikis, blogs, discussion forums, glossaries and quizzes.

More specifically, the philosophy behind Moodle is concerned with theories of socio-constructivist pedagogy. "This means its goal is to provide a set of tools that support an inquiry- and discovery-based approach to online learning" (Brandl, 2005, p. 16). Learners are encouraged to work together, acting as learners and teachers in the online learning environment. Learners can collaborate using the above-mentioned activities, and they are able to observe the activities of their peers (Moodle Pty Ltd, 2014).

The learning environment in Moodle is set up according to the constructivist, and in particular the socio-constructivist, theory of learning. The fact that the current teaching practice at Grey College is not based on this theory is discussed in Chapter 3. A discussion then also follows concerning the compatibility of the theories underlying these learning environments.

2.4. Models of Instructional Design

Instructional design is the foundation of developing a learning environment that not only promotes the acquisition of knowledge, but also to enhances the efficiency, effectiveness and appeal of the process of acquisition. "The term instructional design refers to the systematic and reflective process of translating principles of learning and instruction into plans for instructional materials, activities, information resources, and evaluation" (Smith & Ragan, 1999, p. 2)

Merrill et al. (1996) explain instruction as a science that involves "directing students to appropriate learning activities; guiding students to appropriate knowledge; helping students

rehearse, encode and process information; monitoring student performance; and providing feedback as to the appropriateness of the student's learning activities and practice performance" (Merrill, et al., 1996, p. 6). According to Merrill et al. (1996, p. 6), instructional design is then the technology that is used to create "learning experiences and learning environments which promote these instructional activities". The theories underlying instructional design are discussed below.

While all the theories in instructional design play an important role in the development of course material, it is useful to consider a systematic approach to instructional design, especially in the case of e-learning course development.

Two systematic approaches to instructional design are discussed:

- The ADDIE Model of Instructional Design
- The Dick and Carey Systems Approach Model

2.4.1. The ADDIE Model of Instructional Design

ADDIE is an acronym for Analysis, Design, Development, Implementation, Evaluation – the five phases of which this instructional model comprises. This model consists of an iterative process with clearly defined steps to guide a teacher towards the development of course material (Peterson, 2003).

In a document authored by the Food and Agriculture Organization of the United Nations (FAO), the development of online learning material is discussed within the framework of the ADDIE model. A graphical representation used by the Food and Agriculture Organization of the United Nations (2011) is given in Figure 2.1.

Figure 2.1: ADDIE model according to FAO (2011)

The ADDIE model for e-learning

ANALISYS	DESIGN	DEVELOPMENT	IMPLEMENTATION	EVALUATION
NEEDS ANALISYS	LEARNING OBJECTIVES	CONTENT DEVELOPMENT	INSTALLATION AND DISTRIBUTION	REACTIONS
	SEQUENCING			LEARNINGS
TARGET AUDIENCE ANALISYS	INSTRUCTIONAL STRATEGY	STORYBOARD DEVELOPMENT	MANAGING LEARNER'S ACTIVITIES	BEHAVIOUR
	DELIVERY STRATEGY			RESULTS
TASK AND TOPIC ANALISYS	EVALUATION STRATEGY	COURSEWARE DEVELOPMENT		

A brief overview of each of these phases from the perspective of Peterson (2003) and the FAO (2011) is now given.

Analysis phase

The analysis phase consists of identifying the target audience. A needs analysis is done to determine what the students bring to the task, and what they still need to be taught. Based on the findings of the needs analysis, a task and topic analysis is done to determine the course content (FAO, 2011, p. 21) and also the amount of instruction needed (Peterson, 2003).

Design phase

During the design phase it is important to establish the learning objectives of the course and the sequence in which these objectives should be achieved (FAO, 2011, p. 21). The strategy for achieving should also be outlined in terms of how content is taught and what media or tools are used to deliver the content. During this phase the evaluation strategy is also outlined (Peterson, 2003).

Development phase

During this phase, the planning and research done in the first two phases are used in this phase as production (Peterson, 2003). In this stage, three steps are identified by Peterson (2003): drafting, production and evaluation. For the drafting phase, the FAO (2011, p.22) suggests storyboard development, that is a detailed plan of all material that will be developed. The production step consists of creating the materials, in the case of the FAO (2011, p.22), the online learning materials by incorporating tools identified in the design phase. The evaluation step suggested by Peterson (2003) consists of assessing and improving the developed materials until materials are ready to be implemented.

Implementation phase

This phase consists of presenting the learning content to the learners. In the case of e-learning, the "courseware is installed on a server and made accessible for learners. In facilitated and instructor-led courses, this stage also includes managing and facilitating learners' activities" (FAO, 2011, p. 22).

Evaluation phase

While the development phase also contained an evaluating step, this was done in the form of formative evaluations. At the end of the implementation phase, however, it is suggested that summative evaluation takes place to improve on the developed content (Peterson, 2003).

2.4.2. The Dick and Carey Systems Approach Model

The systems design approach suggested by Dick, Carey and Carey highlight that the major phases of instructional design are "analysis, design, development, implementation, and evaluation" (Dick, et al., 2001, p. 4). It is clear that their approach is based on the ADDIE model, but offers a more detailed system. The model suggested by Dick, Carey and Carey (2001, p. 4) consists of ten steps. A graphical representation is shown in Figure 2.2 and the steps are briefly discussed below.

Figure 2.2: The Dick and Carey Systems Approach Model
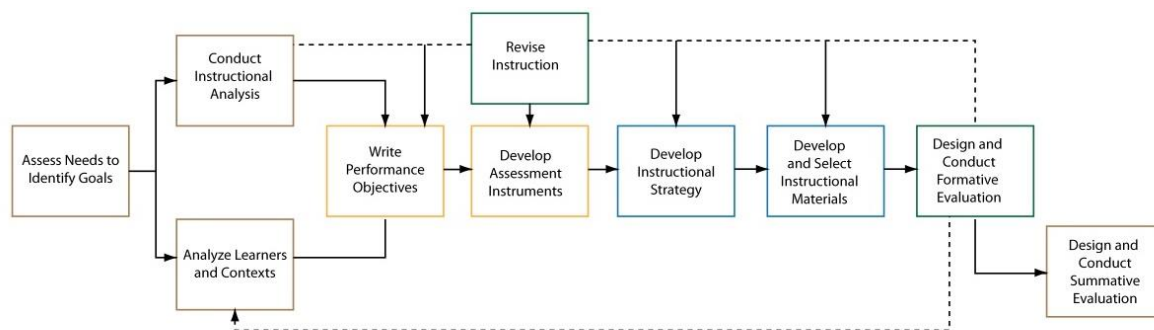
Adapted from Dick, Carey, Carey (2001)

The steps in the model are listed very briefly below. For an in-depth discussion of this approach, the reader is referred to Dick, Carey and Carey (2001). The steps are listed using the same terms as Dick, et al. (2001).

Assess Needs to Identify Goal(s)

"Instructional goals are clear statements of behaviours that learners are to demonstrate as a result of instruction" (Dick, et al., 2001, p. 30). This first step therefore consists of identifying what it is the learners should master through this course. In this step it is important to identify "(1) who the learners are, (2) the context in which they will use the skills, and (3) the tools that will be available" (Dick, et al., 2001, p. 22).

Conduct Instructional Analysis

When conducting instructional analysis, the prerequisite knowledge and skills necessary for the instruction are identified. These are referred to as "entry behaviours" (Dick, et al., 2001, p. 7).

Analyse Learners and Contexts

This analysis runs parallel with the instructional analysis (Dick, et al., 2001, p. 7) and consists of identifying the knowledge and skills that learners bring to the task in terms of skill, knowledge and attitude. These characteristics and the setting in which instruction is to be delivered are identified and analysed in this step.

Write Performance Objectives

In this stage, the needs and goals, identified in the first three steps, are converted into specific and detailed objectives. These objectives will "identify the skills to be learned, the conditions under which the skills must be performed, and the criteria for successful performance" (Dick, et al., 2001, p. 7).

Develop Assessment Instruments

This step consists of developing assessment measures to determine whether the goals and objectives defined are achieved. It is of great importance to ensure that the objectives described relate to what the assessment requires (Dick, et al., 2001, p. 7).

Develop Instructional Strategy

In this step, all information obtained in the previous steps is used to "identify the strategy that you will use in your instruction to achieve the terminal objective" (Dick, et al., 2001, p. 7). An overview should be given of how instructional activities will relate to the objectives identified. In this phase, the medium of delivery is also chosen (Dick, et al., 2001, p. 225). A decision towards a specific strategy is made based on learning theory and research, the current context and learner analysis, and the medium through which the content will be delivered.

Develop and Select Instructional Materials

This step concerns the production of the instruction materials based on the instructional strategy (Dick, et al., 2001, p. 7). Instructors or designers have all the information obtained in

the preceding steps to their disposal when developing materials. It is important, however, to recognise that materials developed will be "reviewed and revised based on feedback from learners, instructors and subject-matter experts" (Dick, et al., 2001, p. 269).

Design and Conduct the Formative Evaluation of Instruction

In this step, evaluations are conducted to "identify how to improve instruction" (Dick, et al., 2001, p. 8). Feedback from learners and instructors may play a big role in this step, and materials are revised based on this feedback, in areas where materials are deemed lacking. (Dick, et al., 2001, p. 312). This step may consist of an iterative process whereby evaluation datasets are gathered, the materials are updated, and evaluated again.

Revise Instruction

This step is seen as the final step, but also the first step in a repeat cycle. The line designated as "Revise Instruction" in Figure 2.2 shows that this step does not only apply to the revision of instructional materials, but also to earlier stages, *e.g.* the identification of objectives (Dick, et al., 2001, p. 8).

<u>Design and Conduct Summative Evaluation</u>

Finally, an overall evaluation takes place. This step evaluates the implementation of the instruction as a whole and is conducted to "make decisions about whether to maintain or adopt instruction" (Dick, et al., 2001, p. 369).

The instructional design models provide guidelines for course and material development. An important aspect of both of the above-mentioned models is concerned with analysis of the teaching environment. As this study is concerned specifically with German language teaching, an overview of the current state of German as a foreign language in South Africa follows.

2.5. German as a Foreign Language in South Africa

It seems that over the past decade, the interest in learning German as a foreign language has declined in many secondary schools in the United Kingdom (Paton, 2010; Payne, 2012). A study by Payne and Spurgin (2013) examined this decline in more detail by asking secondary school learners what they know of the German culture. The authors found that many learners know very little about the German culture. They posit that this might be a reason for the decline in the interest in German as a foreign language and suggest "that more engagement with German culture can make German seem more attractive to pupils" (Payne & Spurgin, 2013).

To shed the light on more local issues, Mbohwa-Pagels and Rode (2014) explain the current situation of German as a Foreign Language in South Africa. Currently the subject is offered in all provinces except Limpopo and there are 80 registered secondary schools offering German as a foreign language in the country. The Western Cape holds the most schools offering German as a foreign language, followed by Gauteng and KwaZulu Natal. In the years directly following the end of the apartheid era, the number of schools offering German as a Foreign Language, and therefore also the number of learners taking the subject, declined drastically. In recent years, however, it seems that the number of German learners has increased or at least stayed constant (Mbohwa-Pagels & Rode, 2014).

Mbohwa-Pagels and Rode (2014) elaborate the current state of language politics according to the LiEP (1997):

"This approach is in line with the fact that both societal and individual multilingualism are the global norm today, especially on the African continent. As such, it assumes that the learning of more than one language should be general practice and principle in our society. That is to say, being multilingual should be a defining characteristic of being South African. […] Whichever route is followed, the underlying principle is to maintain home language(s) while providing access to and the effective acquisition of additional language(s)." (LiEP, 1997, p. 1)

They furthermore explain that multilingualism refers to the advancement of all the official languages, but also other languages that are spoken in certain societies and important for religious or international trade and communication reasons (Mbohwa-Pagels & Rode, 2014, p. 14).

The Incremental Introduction of African Languages Policy (IIAL) states that all primary schools are required to offer an official language as compulsory subject. This is based on the "view that each South African should be able to speak at least one of the previously disadvantaged African languages" (Mbohwa-Pagels & Rode, 2014, p. 14). The aim is that, from 2015, all primary schools should introduce an official African language from Grade 1. The question then remains whether another additional non-official language, like German, will still feature in the learning plans of many schools.

According to Baker (2007), however, the fact that schools are now offering local languages as additional languages should not mean "that foreign languages should now be marginalised or phased out of the school curriculum" (Baker, 2007, pp. 30,31). On the contrary; Baker (2007) argues that the advancement of the "status of the indigenous languages can go hand in hand with continuing to teach German as a foreign language".

Mbohwa-Pagels and Rode (2014) argue that German as a foreign language will have to be offered out of regular school hours. In many schools (29 out of the 80 registered schools) this is already the case, and it seems that the other 51 schools will also follow suit.

Recently, Grey College Secondary School in the Free State, has changed its policy regarding German as a foreign language. In previous years, German as a foreign language was a compulsory subject for all Grade 8 and Grade 9 learners. Since the beginning of 2014, however, the Grade 8 learners are allowed to choose between German and Sotho as a subject (Grey College, 2014). With this it does seem that an increase in the interest in Sotho will mean

a decline in the interest in German. From the perspective of German teachers, it is therefore beneficial to introduce into the German learning plan a component that would increase learners' interest in the subject, as Payne and Spurgin (2013) also suggest. Mbohwa-Pagels and Rode (2014) describe that the implementation of exchange possibilities between South Africa and Germany or other German-speaking countries would also lead to an increase in the interest in German.

Expanding on the idea of Payne and Spurgin (2013), which consists of introducing more about German culture into the learning plan, the use of multi-media and Computer Assisted Language Learning through web-based applications in the learning plan of German as a foreign language is proposed.

Chapter 3 - A Portrait of German at Grey College

This chapter provides a description of the current teaching practice at Grey College, the school in Bloemfontein where the research is conducted. The design of the learning environment for the teaching practice is then identified in terms of one of the three central learning theories discussed in Chapter 2. Finally, a discussion follows, regarding compatibility of the theory influencing the Moodle learning environment and the current teaching environment at Grey College.

The current approach at Grey College in – especially beginner – German teaching is one where nothing happens without the teacher. The teacher explains a concept first and then exercises are given. Learners are not expected to prepare for class, but rather to revise after the class and identify problems and questions they might have.

The teacher explains everything, and everything that the learners know, they have been taught by the teacher. Learners are not expected to know more than they were taught. In some cases it has also been noted that learners are initially only taught a certain language construct, but not given an explanation on how it works. An example is the following:

Learners have to start learning the concept of *Akkusativ* (the accusative case). The teachers feel that there is not enough time before the examination to explain everything, but would like to test this in the examination. Learners are therefore taught: When the verb is *haben* and the noun is masculine (*i.e.* a noun with *der* as article), then *der* changes to *den*, *ein* changes to *einen*, *mein* to *meinen*, *etc*.

In some cases the teacher expects the learners to repeat and imitate what she teaches them. This is seen with most concepts that, according to the teacher, the learners "just have to know".

One of the first examples is the conjugation of the verb *sein* (to be). The teacher snaps her fingers rhythmically while saying "*ich bin, du bist, er/sie/es ist, wir sind, ihr seid, sie und Sie sind*". This is repeated a few times and the learners are then expected to learn this rhythmic 'song' by heart. The learners get a chance to repeat this in the class, and those who can still remember it in the next contact session, are rewarded with a sweet.

3.1. Identifying the Teaching Practice within the Framework of Learning Theories

The situation described above is a clear example of the behaviourist view on learning and instruction. Learners are taught concepts in 'bite-size portions', having to master one aspect of the course, before being allowed to learn the next. The learners are provided with feedback, as a form of reward, when they correctly respond to given cues representing the stimuli. The teacher, not the learner, is in control of the learning process.

It is worth mentioning that this is the current practice for German teaching at Grey College. The aim of this study is not to evaluate this current system critically, but rather to determine whether there is room for incorporating technology into the system. The teaching methods used in this study should, therefore, completely function within the current practice. In other words, the experimental group will not be introduced to an entire new teaching method, but rather be exposed to alternative methods within the constraints of the current system. The next section explains whether the theory underlying the current teaching environment at Grey College is indeed compatible with the theory underlying the Moodle learning environment.

3.2. Conclusion: Does Moodle imply a Specific Theory for Language Teaching?

It has been established that the learning environment in Moodle is based on a social constructivist point of view. The question remains whether using Moodle within an environment that predicates a purely behaviourist view still makes sense. This section is dedicated to identifying aspects of Moodle that are consistent with the behaviourist view on learning.

"It is possible to use a [sic] Moodle, for example, for purely behaviourist type mechanical drills and compliancy training" (Pinner, 2011, p. 7).

Modules of Moodle that are available for use within the behaviourist view include:

- The Game module (learners are rewarded for correct responses)
- The Quiz module (learners are given feedback, and may re-attempt quiz to answer questions correctly)

- The Lesson module (learners are only allowed to progress in the lesson, when they have answered correctly)

It is therefore important to note, that, while Moodle advocates a constructivist view on learning, it is possible to implement certain aspects of Moodle into a learning environment that is completely disconnected from the constructivist view. In this research, the implementation on certain aspects of Moodle into a behaviourist teaching setting is investigated.

Chapter 4 - Research Methodology

In this chapter an overview is given of how the study is conducted. Section 4.1 explains how the control and experimental groups are determined while Section 4.2 discusses the experimental strategy of the research. The statistical analyses done in this study are discussed in Section 4.3. The final section, Section 4.4 provides an overview of the ethical considerations in this study.

It is important to distinguish between three levels of methodology: research methodology, teaching practice and methodology of material development. The current research is focused on the statistical analysis of the results when implementing elements of a blended learning approach, and not the methodology of material development or implementation. This chapter therefore only covers research methodology.

A discussion of the material development and implementation is given in Chapter 5.

4.1. Participants: Control Group and Experimental Group

The learners participating in this study are Grade 8 learners from four classes at Grey College, a high school for boys in Bloemfontein. The classes into which the learners are divided, however, can hardly be referred to as homogenous. As Grey College is a parallel medium school, some of the classes are taught in English and some in Afrikaans. The classes are also taught by two different teachers. It would not be wise to choose one or two of the classes as an experimental group, because the control and experimental groups should ideally be as similar as possible.

Ideally, the learners should be randomised into one of the two groups. However, it has been noted that learners who indicate that they wanted to be part of the study, do so in order to work on Moodle and may withdraw if they are randomised into the control group. Similarly, learners who do not want to work on Moodle, did not complete the consent and assent forms. Randomising learners who completed the consent and assent forms therefore leads to a much smaller sample. Therefore, the learners, across all the classes, who indicate that they are willing to participate in the study, are automatically assigned to the experimental group. This means that only learners with computer access and who want to work on Moodle need to provide the completed consent and assent forms. The experimental group will henceforth be referred to as the Moodle group.

Learners who do not complete the consent and assent forms are automatically assigned to the control group – as they continue doing homework in the way that they have been used to. The school has granted permission to use the marks of all these learners for the analysis.

4.2. Experimental strategy

The aim is to show that use of an online learning approach in teaching German as a foreign language has a positive influence on the learners' basic German skills. It is therefore suggested that this approach be used to augment face to face teaching. In other words, the teachers continue teaching German in their usual way; the exercises provided for the purposes of this study are additional assignments to be done outside of the contact sessions.

There are two sets of additional notes, exercises, and assignments:

- Set one for the control group consists of conventional assignments. Learners receive additional notes, examples and exercises in hard copy.
- Set two for the experimental group consists of online examples, exercises, assignments and the use of multimedia, through the online learning platform, Moodle.

These two sets will cover the content in the same sequence, as the aim is only to determine whether the medium through which the additional training and teaching is done, makes a significant difference in learners' performance and motivation in the subject.

This approach was implemented during the third term of 2014. The learners in the experimental group are given proper guidance and training in the use of Moodle as learning platform.

The learners in both groups will be taught the same basic concepts during their classes at school, using the same methods. The difference between the groups lies within the medium through which they submit their homework assignments.

The homework of both groups is assessed continually throughout the term and the marks recorded. At the end of the term, both groups write the same exam. The marks of the exam and the marks of the homework throughout the term are used in the statistical analysis to determine the effectiveness of the blended learning approach. This should provide a thorough indication of the effectiveness of the implementation of Moodle exercises in German teaching for Grade 8 beginner German learners. It is worth noting that the learners'

communicative ability is not tested. This study is focussed on grammar, vocabulary and reading competency.

An account of how the learning materials for suggested approach are analysed, developed and assessed within the constraints of the current teaching system at Grey College, is provided in Chapter 5.

The next section provides an overview of how the learners' motivation in German might bias the results in this study and how this is handled.

4.3. Eliminating the Effect of Other Variables

A short informal survey regarding learners' motivation and interest in the subject was conducted at the beginning and at the end of the study. This survey serves two purposes: first, to establish that lack of motivation is not a problem for the learners in Grade 8 and, second, to show that motivation is not another underlying variable that changed over time and that might bias the results.

The survey consists of 11 questions, divided into three parts. In the first part of the survey, questions are asked that shed light on variables that might influence the learners' responses. In these questions learners are asked to outline their language of instruction, home language, German teacher and age.

The second set of questions constitutes the data used for the analyses, and consists of five questions. The first four questions cover learners' enjoyment of German classes, enjoyment of German homework, how well they believe they understand the subject and how they like the German language. These questions have the same format: a one to five Likert scale (one signifying a negative experience or feeling and five meaning a wonderful experience). The last question is a Yes/No question to identify learners' willingness to continue with German as a subject when they are allowed to choose their subjects in Grade 10. Only these five questions will feature in the discussion of the survey.

This survey is repeated at the end of the study, to ensure that learners' motivation has not changed over the testing period. If the learners' motivation did not change over the testing period, it is assumed that this variable stayed constant, and would therefore not affect the outcome of the study. If motivation changed over the testing period, this should also be taken

into account when making inferences based on the results obtained. An example of this survey is included in the thesis as Appendix A.

When the suggested approach has been implemented, two analyses are done to determine the effect of the approach on learners' performance in German as a foreign language. The next section explains these analyses.

4.4. Analyses

The objective of this study is to determine whether incorporating the approach using Moodle contributes to an improvement in learners' performance in German. This section describes the statistical analyses proposed to determine whether this hypothesis holds.

An initial statistical analysis is done, before the results are analysed for the purposes of this study. Since the aim is to perform t-tests on the data, it is important to assess whether the data follow a normal distribution (Razali & Wah, 2011). The marks are first tested for normality in two ways: by using a QQ-plot and by performing a Shapiro-Wilks test.

A Q-Q plot is a graphical representation of data that compares the quantiles of the sample data to the quantiles of a univariate normal distribution. The quantiles of the normal distribution are represented by a straight line. If the sample quantiles deviate severely from this straight line, this indicates a non-normal distribution. The Shapiro-Wilks tests is another (Razali & Wah, 2011) test for univariate normality, based on a test statistic calculated from the ratio of ordered sample values. The p-value resulting from this test indicates whether the null hypothesis of normality should be rejected or not. Both of these analyses are done with the software package R (R Core Team, 2014).

The data set used for these tests is based on the second term exam results for each of the groups.

Once normality is established, an F-test for normal samples determines whether the groups have equal or unequal variances. The statistic for a t-test for similar means is then calculated (the calculation of the statistic is influenced by whether variances are assumed to be equal or unequal). The calculated t-test statistic, or the p-value resulting from the test indicates whether the means of the two groups are similar or significantly different.

To determine whether the implementation of the suggested approach had a significant influence on the learners' performance in German, two sets of data will be analysed: the results of continuous assessment and the results of examination assessment.

All the analyses described in this section will follow the same steps:

- Describe the data

- Name the statistical test

- State the hypotheses

- Calculate the test statistic

- Determine the critical value

- Choose whether to reject or not reject the null hypothesis.

A significance level of $\alpha = 0.05$ will be used throughout. The significance level α describes the probability of rejecting H_0 when it is in fact true. The traditional choice for significance level is $\alpha = 0.05$, since this allows for finding relationships within the data, while limiting the possibility of rejecting H_0 when it is in fact true. If $\alpha = 0.05$, this means that there is a 5% chance that a difference between the two groups is implied, when, in reality there is no difference.

Many of the analyses done are multivariate analyses. Therefore, methods used are those explained by Rencher (2002). All calculations are done using the programming software package R (R Core Team, 2014).

4.4.1. Determining the Influence on Learners' Performance in German: Continuous Assessment

The results of continuous assessment of the two groups will be compared. The continuous assessment is based on the grades learners received for the homework assignments.

Data:

Table 4.1 provides an example of the data set for the grades for the Moodle group's assignments, where x_{ij} denotes the mark of the ith student's j^{th} assignment, and $\bar{x}_{.j}$ denotes the average grade for assignment j across all students; calculated as:

$$\bar{x}_{.j} = \frac{\sum_1^m x_{ij}}{m}$$

Where j denotes the assignment number and m the number of students in the Moodle group. For example, the mean grade for Assignment 1 will be the sum of the grades of all the students in the Moodle group, divided by the number of students in the Moodle group.

Table 4.1: Data Set for Continuous Assessment: Moodle Group (X)

Subject number	Assignment 1	Assignment 2	$\cdots$	Assignment k
$x1$	x_{11}	x_{12}	$\cdots$	x_{1k}
$x2$	x_{21}	x_{22}	$\cdots$	x_{2k}
$x3$	x_{31}	x_{32}	$\cdots$	x_{3k}
$\vdots$	$\vdots$	$\vdots$	$\ddots$	$\vdots$
xm	x_{m1}	x_{m2}	$\cdots$	x_{mk}

$\bar{x}$	$\bar{x}_{\cdot 1}$	$\bar{x}_{\cdot 2}$	$\cdots$	$\bar{x}_{\cdot k}$

For simplicity $\bar{x}_{\cdot i}$ will henceforth be denoted as $\bar{x}_i$

The vector $\bar{\boldsymbol{x}}$ is defined as the vector of mean grades for the k assignments:

For the control group, the data set looks similar to the set in Table 4.1. In this case, the values are denoted by y_{ij} and there are n observations (*i.e.* students). The mean grade of each assignment for the control group, is calculated similarly, and is denoted by $\bar{y}_j = \frac{\sum_1^n y_{ij}}{n}$ for assignment j, where n denotes the number of students in the control group.

If there is a total of k assignments, k means are calculated for each group:

- $\bar{x}_1, \bar{x}_2, \cdots, \bar{x}_k$ for the Moodle group, and
- $\bar{y}_1, \bar{y}_2, \cdots, \bar{y}_k$ for the control group.

The k means constitute the vector of calculated means for each group; denoted by $\bar{\boldsymbol{x}}$ for the Moodle group and $\bar{\boldsymbol{y}}$ for the control group.

$$\bar{\boldsymbol{x}} = \begin{bmatrix} \bar{x}_1 & \bar{x}_2 & \cdots & \bar{x}_k \end{bmatrix}$$
$$\bar{\boldsymbol{y}} = \begin{bmatrix} \bar{y}_1 & \bar{y}_2 & \cdots & \bar{y}_k \end{bmatrix}$$

The aim of this analysis is to determine whether there is a difference in assignment grades between learners working on Moodle and learners not working on Moodle. The two mean vectors of the populations are defined below.

- $\boldsymbol{\mu}_x$ denotes the mean vector of assignment grades for the learners in general that work on Moodle.
- $\boldsymbol{\mu}_y$ denotes the mean vector of assignment grades for learners in general that do not work on Moodle.

Statistical test:

The tested hypothesis in this case is whether there is a difference between $\boldsymbol{\mu}_x$ and $\boldsymbol{\mu}_y$. Because $\boldsymbol{\mu}_x$ and $\boldsymbol{\mu}_y$ denote vectors consisting of more than one value (the number of assignments), a regular univariate t-test will not be sufficient. Therefore a multivariate Two-Sample T^2 test as suggested by Rencher (2002, p. 123) is performed.

Hypotheses:

Since the aim is to determine whether there is a significant difference between $\boldsymbol{\mu}_x$ and $\boldsymbol{\mu}_y$, the null hypothesis (H_0) and alternative hypothesis (H_1) are defined as:

$$H_0: \boldsymbol{\mu}_x = \boldsymbol{\mu}_y \ vs \ H_1: \boldsymbol{\mu}_x \neq \boldsymbol{\mu}_y$$

Test statistic:

Hotelling's T^2 – statistic is calculated as follows:

$$T^2 = \frac{m \times n}{m + n}(\overline{\boldsymbol{x}} - \overline{\boldsymbol{y}})' S_p^{-1}(\overline{\boldsymbol{x}} - \overline{\boldsymbol{y}})$$

Equation 4.1

Where $(\overline{\boldsymbol{x}} - \overline{\boldsymbol{y}})$ denotes the vector of differences between the average of the two groups, $(\overline{\boldsymbol{x}} - \overline{\boldsymbol{y}})'$ denotes the transpose of the vector of differences, and S_p^{-1} denotes the pooled covariance matrix of the two groups. The terms m and n denote the number of students in the Moodle and control group, respectively.

Critical value:

Under the null hypothesis, it is assumed that the T^2 test statistic multiplied by a constant follows an F -distribution with parameters k (number of assignments) and $N - k + 1$ (where $N = m + n - 2$), and that the critical value is denoted as:

$$F_{k,N-k+1,1-\alpha}$$

This means that H_0 is rejected when:

$$F = \frac{T^2}{N} \times \frac{N - k + 1}{k} \geq F_{k,N-k+1,1-\alpha}$$

Equation 4.2

Rejecting of Null hypothesis:

If the null hypothesis is rejected, this means that there is a significant difference between the mean vectors of the two groups. If this is the case, a univariate Student's t-test is performed to determine whether there was a significant difference for each of the assignments. Furthermore, if the null hypothesis is rejected, the means of the two groups across all the assignments are compared to determine which group performed better.

If the null hypothesis is not rejected, it can be assumed that there is not enough evidence to suggest a significant difference between the two groups and no further tests are done.

4.4.2. Determining the Influence on Learners' Performance in German: Examination Assessment

The second set of analyses is concerned with the results obtained by comparing the examination written in the second term (pre-implementation) and the examination written in the third term (post-implementation) for each learner in both of the groups. These examinations will be referred to as the first examination (second term) and second examination (third term).

Two analyses will be done with the results obtained from the examinations:

1. An analysis on the change of the total score for each learner, and
2. An analysis for each of the following divisions in the examination: Reading, Vocabulary and Grammar.

Analysis of the Change of the Total Score for Each Learner

To determine whether there is a difference between change in total grades in the Moodle group and the change in grades in the control group, a univariate Student's t-test is performed. In this analysis, the aim is to determine whether there is a significant difference between the change in the Moodle group's examination scores, and the change in the control group's scores. Even if the two populations were not statistically similar initially, the results of this analysis will be useful. This is because only the change in marks or examination scores is observed. If, *e.g.* both groups performed worse in the second exam than the first exam, the results of this analysis should show whether the drop in scores of one of the groups is smaller than that of the other.

Data:

In this case, the data considered is not the mean score of each group as in the previous section, but rather the mean difference in test scores from the second and the third term. Table 4.2 shows the data for the Moodle group for this analysis:

Table 4.2: Data Set for difference in Exam Totals: Moodle Group (X)

Subject number	Exam 1	Exam 2	Change in Exam Totals $(2^{nd}\ exam - 1^{st} exam)$
$x1$	x_{11}	x_{12}	$d_{x1} = x_{12} - x_{11}$
$x2$	x_{21}	x_{22}	$d_{x2} = x_{22} - x_{21}$
$x3$	x_{31}	x_{32}	$d_{x3} = x_{32} - x_{31}$
$\vdots$	$\vdots$	$\vdots$	$\vdots$
xm	x_{m1}	x_{m2}	$d_{xm} = x_{m2} - x_{m1}$
			$\bar{d}_x$

Where $\bar{d}_x = \frac{\sum_{j=1}^{m} d_{xj}}{m}$ represents the mean of the differences in total score for the first and second examination opportunity in the Moodle group. Again, the data set for the students in the control group is similar to Table 4.2, consisting of entries denoted by y_{ij} with the mean

of differences for the control group represented by $\bar{d}_y = \frac{\sum_{j=1}^{n} d_{yj}}{n}$ (where n denotes the number of subjects in the control group).

The aim of this analysis is to determine whether there is a difference in the change between the first and second exam opportunities. The observed mean differences are defined above as $\bar{d}_x$ and $\bar{d}_y$ for the Moodle and control group, respectively. The two mean difference parameters of the populations are defined below.

- $\bar{\delta}_x$ denotes the mean difference between the first and second examination for learners in general that work on Moodle.
- $\bar{\delta}_y$ denotes the mean difference between the first and second examination for learners in general that do not work on Moodle

Statistical test:

The tested hypothesis in this case is whether there is a difference between $\bar{\delta}_x$ and $\bar{\delta}_y$. Because $\bar{\delta}_x$ and $\bar{\delta}_y$ only each only denotes a single value, a regular univariate t-test will be sufficient to test the difference. The same steps in the hypothesis test, as outlined above are discussed.

Hypotheses:

Since the aim is to determine whether there is a significant difference between $\bar{\delta}_x$ and $\bar{\delta}_y$, the null hypothesis (H_0) and alternative hypothesis (H_1) are defined as:

$$H_0: \bar{\delta}_x = \bar{\delta}_y \; vs \; H_1: \bar{\delta}_x \neq \bar{\delta}_y$$

Test statistic:

For the purposes of this analysis, it is established that the difference between the first and second examinations for Moodle group and control group have equal variances, but different sample sizes (m and n for the Moodle and control group, respectively). The test statistic is then defined as follows:

$$t = \frac{\bar{d}_x - \bar{d}_y}{s_{xy} \times \sqrt{\frac{1}{m} + \frac{1}{n}}}$$

Equation 4.3

Where $\bar{d}_x$ denotes the mean difference between the two examinations for the Moodle group, and $\bar{d}_y$ that of the control group. The sample sizes of the Moodle group and control group are denoted by m and n, respectively. The estimator of the common standard deviation, s_{xy}, is calculated as follows:

$$s_{xy} = \sqrt{\frac{m \times s_x^2 + n \times s_y^2}{m + n - 2}}$$

Equation 4.4

Where s_x^2 and s_y^2 denote the standard deviations of the differences between the examinations for the Moodle and control group, respectively.

<u>Critical value:</u>

Under the null hypothesis, it is assumed that the t test statistic m follows a Student's t-distribution with $m + n - 2$ degrees of freedom, and that the critical value is denoted as:

$$t_{m+n-2,1-\alpha}$$

This means that H_0 is rejected when:

$$t = \frac{\bar{d}_x - \bar{d}_y}{s_{xy} \times \sqrt{\frac{1}{m} + \frac{1}{n}}} \geq t_{m+n-2,1-\alpha}$$

Equation 4.5

<u>Rejecting of Null hypothesis:</u>

If the null hypothesis is rejected, this means that there is a significant difference between the change of examination results in the one group and the change of exam results in the other. If the null hypothesis is rejected, the mean differences of the two groups are compared to determine which group encountered the biggest change between the first and second examinations.

Analysis for Each of the Divisions in the Examination: Reading, Vocabulary and Grammar

With the data collected from the examination results in the beginning and end of the study, the analysis can be expanded to consider the change between the beginning and end examinations for the following divisions: Reading, Vocabulary and Grammar.

This analysis is similar to the analysis done on the continuous assessment, as it is also a multivariate analysis. This analysis is also similar to the analysis done on the change in total examination scores, in the sense of the parameters of interest still being the difference between the first and the second exam.

Data:

In this case, the data considered is a mean vector consisting of three values that indicate the change in each of the divisions of the examination. Table 4.3 shows the data for the Moodle group for this analysis:

Table 4.3: Data Set for difference in Exam Divisions: Moodle Group (X)

Subject number	Exam 1			Exam 2			Change in Exam Totals $(2^{nd}\ exam - 1^{st} exam)$		
	Read	**Vocab**	**Gram**	**Read**	**Vocab**	**Gram**	**Read**	**Vocab**	**Gram**
$x1$	x_{11r}	x_{11v}	x_{11g}	x_{12r}	x_{12v}	x_{12g}	d_{x1r}	d_{x1v}	d_{x1g}
$x2$	x_{21r}	x_{21v}	x_{21g}	x_{22r}	x_{22v}	x_{22g}	d_{x2r}	d_{x2v}	d_{x2g}
$x3$	x_{31r}	x_{31v}	x_{31g}	x_{32r}	x_{32v}	x_{32g}	d_{x3r}	d_{x3v}	d_{x3g}
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$
xm	x_{m1r}	x_{m1v}	x_{m1g}	x_{m2r}	x_{m2v}	x_{m2g}	d_{xm1r}	d_{xm1v}	d_{xmg}

$\bar{d}_x$							$\bar{d}_{xr}$	$\bar{d}_{xv}$	$\bar{d}_{xg}$

This table is more complex, but is essentially an expansion of Table 4.1. In Table 4.3 there are m observations. The values for $\bar{d}_{xr}$, $\bar{d}_{xv}$ and $\bar{d}_{xg}$ (calculated as: $\bar{d}_{xi} = \frac{\sum_{j=1}^{m} d_{xji}}{m}$; $i \in r, v, g$) denote the means of the differences between the second and first examinations for the three divisions: Reading, Vocabulary and Grammar. These three means constitute the entries for

the mean difference vector $\bar{\boldsymbol{d}}_x$ for the Moodle group. Again, the data set for the control group is similar. This group has n observations, where entries are denoted by, *e.g.* y_{ijr}, and the mean differences are denoted by $\bar{d}_{yr}$, $\bar{d}_{yv}$ and $\bar{d}_{yg}$ (calculated as: $\bar{d}_{yi} = \frac{\sum_{j=1}^{n} d_{xji}}{n}$; $i \in r, v, g$) and constitute the mean vector $\bar{\boldsymbol{d}}_y$ for the control group.

The three mean differences for Reading, Vocabulary and Grammar constitute the mean vector differences for each group; denoted by $\bar{\boldsymbol{d}}_x$ for the Moodle group and $\bar{\boldsymbol{d}}_y$ for the control group.

$$\bar{\boldsymbol{d}}_x = \begin{bmatrix} \bar{d}_{xr} & \bar{d}_{xv} & \bar{d}_{xg} \end{bmatrix}$$
$$\bar{\boldsymbol{d}}_y = \begin{bmatrix} \bar{d}_{yr} & \bar{d}_{yv} & \bar{d}_{yg} \end{bmatrix}$$

The aim of this analysis is to determine whether there is a difference in the change between all three divisions of the first and second exam opportunities. The observed vectors of mean differences are defined above as $\bar{\boldsymbol{d}}_x$ and $\bar{\boldsymbol{d}}_y$ for the Moodle and control group, respectively. The two mean difference vectors of the populations are defined below.

- $\bar{\boldsymbol{\delta}}_x$ denotes the vector of mean differences in the divisions of the examinations for learners in general that work on Moodle.
- $\bar{\boldsymbol{\delta}}_y$ denotes the mean vector of mean differences in the divisions of the examinations for learners in general that do not work on Moodle.

Statistical test:

The tested hypothesis in this case is whether there is a difference between $\bar{\boldsymbol{\delta}}_x$ and $\bar{\boldsymbol{\delta}}_y$. Because $\bar{\boldsymbol{\delta}}_x$ and $\bar{\boldsymbol{\delta}}_y$ denote vectors consisting of more than one value (the number of divisions in the examination), a regular univariate t-test will not be sufficient. Therefore a multivariate Two-Sample T^2 test as suggested by Rencher (2002, p. 123) is performed.

Hypotheses:

Since the aim is to determine whether there is a significant difference between $\bar{\boldsymbol{\delta}}_x$ and $\bar{\boldsymbol{\delta}}_y$, the null hypothesis ($H_0$) and alternative hypothesis (H_1) are defined as:

$$H_0: \bar{\boldsymbol{\delta}}_x = \bar{\boldsymbol{\delta}}_y \ vs \ H_1: \bar{\boldsymbol{\delta}}_x \neq \bar{\boldsymbol{\delta}}_y$$

Test statistic:

For this analysis Hotelling's T^2 – statistic is calculated as follows:

$$T^2 = \frac{m \times n}{m + n} (\overline{\boldsymbol{\delta}}_x - \overline{\boldsymbol{\delta}}_y)' S_p^{-1} (\overline{\boldsymbol{\delta}}_x - \overline{\boldsymbol{\delta}}_y)$$

Equation 4.6

Where $(\overline{\boldsymbol{\delta}}_x - \overline{\boldsymbol{\delta}}_y)$ now denotes the vector of differences between the average change in examination results of the two groups, $(\overline{\boldsymbol{\delta}}_x - \overline{\boldsymbol{\delta}}_y)'$ denotes the transpose of the vector of differences, and S_p^{-1} denotes the pooled covariance matrix of differences of the two groups. The terms m and n denote the number of students in the Moodle and control group, respectively.

Critical value:

Under the null hypothesis, it is assumed that the T^2 test statistic multiplied by a constant follows an F-distribution with parameters 3 (number of divisions in the exam) and $N - 3 + 1$ (where $N = m + n - 2$), and that the critical value is denoted as:

$$F_{3,N-3+1,1-\alpha}$$

This means that H_0 is rejected when:

$$F = \frac{T^2}{N} \times \frac{N-3+1}{3} \geq F_{3,N-3+1,1-\alpha}$$

Equation 4.7

Rejecting of Null hypothesis:

If the null hypothesis is rejected, this means that there is a significant difference between the vectors change in the two examinations of the two groups. In other words, although both groups experienced change in their examination results, the one group experienced greater change than the other. If this is the case, a univariate Student's t-test is performed to determine whether there was a significant difference for each of the divisions separately. Furthermore, to determine which group experienced the biggest change in survey response between the first and second examination, the mean differences for one group is compared to the mean differences of the other.

If the null hypothesis is not rejected, it can be assumed that there is not enough evidence to suggest a significant difference between the two groups and no further tests are done.

4.5. Ethical Considerations

Risks

This study bears no risks for the participants, as all participants will only be expected to do homework and complete assignments – as they would usually do. Some of the learners will be completing assignments in the conventional way – the way that they have been used to, while others will be submitting assignments online through Moodle. Learners who decide not to participate will not be disadvantaged in any way.

Confidentiality

Confidentiality will be maintained by assigning anonymous subject numbers to each of the participants. These subject numbers will be used to distinguish participants from each other and to determine within and between participant differences in results. A document containing the codes of how subject numbers were assigned as well as subject numbers and names of participants will be kept at the school for control purposes. The results of the examinations will not be made public, and no identifiable information of the participants will be disclosed without consent.

Chapter 5 - Implementation

5.1. Introduction

This section describes the implementation of the proposed research and provides overview of the considerations when developing the learning materials used for the purposes of this study. A description of the model according to which the materials are developed is also given. Three phases of development are discussed: Analysis phase, Development phase and Approval phase.

Since the research is not focused on course development and implementation, this chapter does not serve to discuss or evaluate models of instructional design. This chapter serves to provide an overview of how materials were developed to meet the requirements of the current study.

For the purposes of this study, the ADDIE approach of instructional design was considered and is condensed into three phases. Figure 5.1 represents the three phases and what they consist of.

Figure 5.1: Approach for Development of Learning materials

Analysis
- Identify available tools
- Identify learning content
- Identify learning sequence
- Additional features of online materials

Development and Implementation
- Content development
- Implementation into Moodle

Approval
- Determine whether materials are fit for use within learning constraints of the school

5.2. Phase 1: Analysis

This phase consists of defining the learning content and sequence for German as a foreign language in Grade 8. This phase also focuses on identifying the available tools used for material development, within the constraints of the current learning and teaching environment at Grey College.

5.2.1. Available Moodle Tools

It is therefore important to note that not all modules in Moodle will be applicable in this current system. The Moodle modules used for the purposes of this study are: Glossary Module, Quiz Module, Lesson Module and Game Module. A brief discussion of each of these modules follows.

Glossary Module

This module provides learners with a list of all the words used in the lessons and quizzes. An entry in a Glossary module usually consists of the term to be explained and its definition. This module is especially useful for beginner learners to explain the meanings of new German words. With this module it is also possible to add sound clips or pictures. This means that a sound clip with the correct pronunciation or a picture can also be added to an entry (Moodle Pty Ltd, 2013).

This module further enables learners to create their own entries or comment on other entries. However, this type of learning does not fit into the framework of Grey College's German teaching practice.

A feature of the Glossary module that will be used extensively in the teaching materials for this study is the auto-linking function. This function enables students to access the definition of a German word from within other modules, such as Games, Lessons and Quizzes.

Quiz Module

The quiz module allows teachers to create assignments consisting of questions. This module also allows the teacher several choices. The teacher can choose the type of questions to include in the quiz. The types of questions that will be used for the teaching materials of this study are: multiple choice questions, true or false questions, matching questions, short answer, embedded answer and essay type questions. All the questions created for the quizzes are stored in the Question Bank and teachers are able to reuse the questions in other quizzes or import them into lessons (Moodle Pty Ltd, 2014).

The teacher can further decide on different options for feedback on the questions, and the behaviour of the questions. The current choices in Moodle 2.6 are: Adaptive mode, Deferred feedback, Immediate feedback or interactive with multiple tries. When adaptive mode is

used, the learners are given immediate feedback when answering a question, and they are then able to change their answer, before the quiz is graded. Adaptive mode also provides the option of penalising students for wrong attempts. The deferred feedback mode requires that the learners first complete and submit the entire quiz before the attempt is graded and any feedback is given.

With immediate feedback learners are given feedback on an answer immediately, but they cannot change their answer as is the case with adaptive mode. The interactive mode gives the learner the opportunity to try answering a question again, by clicking the 'Try again' button. As soon as a learner answers a question correctly, the answer cannot be changed. Learners can also be penalised when answering the question incorrectly too many times (Moodle Pty Ltd, 2014).

Additionally, teachers can limit the number of times each learner may attempt the quiz. If the learner is allowed enough retakes, and the quiz is set to only use the highest grade, the learner might continue attempting the quiz until a grade of 100% is obtained.

When auto-linking in the Glossary is used, the learner will be able to read the definition of a word, while in the quiz module. Should the teacher decide that this is not allowed, the linking can be turned off for that specific question.

Lesson Module

The Lesson module consists of "a series of HTML pages" (Moodle Pty Ltd, 2014) containing content and questions. The lessons can be viewed as a flowchart and the progress of each learner is dependent on their understanding of the concept explained in the lesson. The teacher uses content pages to explain the concept, and then tests the learners' understanding by using question pages.

The content pages can consist of different media such as sound clips and pictures to enhance the explanation of the concept she is trying to clarify. Content pages can be followed by other content pages, questions or question clusters. Learners move to different pages by using the navigational buttons on each content page.

Question pages can consist of multiple choice questions, matching questions, essay type questions, numerical questions, true or false questions and short answer questions.

Depending on a learner's response or answer to a question, the learner is then directed to another content page.

Question clusters are groups of questions between content pages. Depending on the settings chosen by the teacher, learners can, *e.g.* only be allowed to move on once they have answered all the questions in the cluster correctly.

When the lesson contains questions, the learner receives a grade for that lesson. Similar to the quiz module, the teacher can decide whether questions may be attempted again, or whether the entire lesson may be re-attempted and also how the grading is handled in the case of multiple attempts (Moodle Pty Ltd, 2014).

Game Module

This module enables learners to practice what they have learned by playing games. The game module uses questions from already established quizzes and glossaries, which means that the teacher does not have to create her own questions again.

The Game module is not a built-in feature like the Glossary, Lesson, and Quiz modules, but rather a plug-in that has to be installed by the administrator. Once the plug-in is installed, the module functions like the other modules mentioned above.

The game module consists of eight games, including known games such as Hangman, Snakes and Ladders, Crossword, Cryptex and Sudoku. Two of the lesser known games in this module are Millionaire and The Hidden Picture.

Millionaire is a game that is similar to the Television show *Who Wants to be a Millionaire?*. In this game, the learner is asked 15 questions, and has three lifelines to use in case of uncertainty. The Hidden Picture uses a picture attached to a glossary entry, and asks questions to reveal parts of the picture. The aim of the game is to identify the glossary entry the picture was taken from, as soon as possible (Moodle Pty Ltd, 2011).

The Forum Module in Moodle makes it possible to start discussions between all the participants of the specific Moodle group. This module will be used to make sure that learners read announcements, and make comments or ask questions when difficulties arise. This will not form part of the teaching materials developed.

Bearing in mind the constraints of the current teaching system as outlined above, an overview is now given of how the suggested approach is implemented.

5.2.2. Identification of Learning Content

Grade 8 teachers have agreed on the learning content outlined below for the Grade 8 German classes. This is the first year that the school implemented the new textbooks, Prima A1 Band 1 by Jin, et al. (2007). The Subject Head of German at Grey College expressed concerns that teachers are not yet accustomed to the new learning pace and sequence of the work. This, together with the problem of few contact sessions – on average, there are two to three German lessons in a week, and the duration of the lessons varies from 30 to 40 minutes – led to a slower pace of completing all the work. (2014, personal communication, 23 May).

The two teachers involved are referred to as Teacher A and Teacher B. Teacher A is the Subject Head of German and decides on the work content and sequence. Teacher A sets the examinations and the assignments. Teacher B is the author of this study and creates all content on Moodle – based on the assignments set by Teacher A. Teacher B is also responsible for creating the class tests.

Tables 5.1 and 5.2 represent the content covered in the first two terms. Table 5.3 presents the content of the third term. The tables include a description of the content, the learning materials used and how the learners are assessed on the content. All tables were adapted from the Grade 8 Learning Content Planning for 2014 compiled by Teacher A, the Subject Head for German at Grey College. The time frame and learning sequence are the same for the Moodle group and the control group, and it is worth mentioning again that the only difference between the two groups is the medium through which homework assignments are submitted.

Table 5.1: Grade 8 German Learning Content for the First Term

Content description	Materials	Assessment
Writing the date in German	Additional notes compiled by teacher A– completed in class.	• Learners are required to write the date in German on all assignments and class tests. • Oral exercise: Learners are asked to tell the class in German, when their birthdays are. • In the examination: Learners are awarded a bonus mark if they write the date in German correctly.

German inventions	Additional notes compiled by teacher A – translated in class	• Class discussion on different inventions – learners are not assessed on this continuously. • In the examination: Learners are asked to name five German inventions in English or Afrikaans.
Verbs (*sein, heißen, kommen, wohnen*) with the conjugation for *ich, du,* and *Sie*.	Prima A1 (Jin, et al., 2007, pp. 5,6)	• Exercises in Prima A1 Arbeitsbuch (Jin, et al., 2007, p. 4) • Class test set by German teacher B. • In the examination: Learners are asked to provide the conjugated form of the verb in a sentence.
Kennenlernen und Begrüßungen: Meeting and Greeting	Additional notes compiled by teacher A.	• Class test set by teacher B. • Oral exercise: Dialogue between two classmates. • In the examination: Learners are asked to translate a greeting sentence from or into German.
Start with vocabulary for Unit 1: Meeting and Greeting	First part of wordlist in Prima A1 Arbeitsbuch (Jin, et al., 2007, p. 11) Translated in class by teacher	• Class test set by teacher B • In the examination: Learners are asked to translate a word or phrase from or into German.

Table 5.2: Grade 8 German Learning Content for the Second Term

Content description	Materials	Assessment
The Alphabet in German	Additional notes (song) compiled by teacher A. Prima A1 (Jin, et al., 2007, p. 8) and audio.	• Oral exercise: Learners are asked to repeat the alphabet and spell their names in German. • Listening exercise: Learners are asked to write down the spelling of the words they hear.
Verbs (*sein, heißen, kommen, wohnen, mögen, machen*) with the conjugation for *ich, du, er/sie/es* and *Sie*.	Prima A1 (Jin, et al., 2007, p. 12) Additional notes compiled by teacher A	• Exercises in Prima A1 Arbeitsbuch (Jin, et al., 2007, pp. 4,5) • Class test set by German teacher B. • In the examination: Learners are asked to provide the conjugated form of the verb in a sentence.

W-Questions:	Prima A1	• Learners are asked to write an Internet-chat about
Wie *heißt du?*	(Jin, et al., 2007, pp.	themselves, including their name, where they come from,
Woher *kommst du?*	7,9,10)	where they live and what they like.
Wo *wohnst du?*		• Exercises in Prima A1 Arbeitsbuch
Was *magst du?*		(Jin, et al., 2007, pp. 5-10)
Wer *bist du?*		• <u>In the examination:</u> Learners are asked to match the W-question with the correct verb, and complete a form in German with details such as name and surname.
Complete vocabulary for Unit 1: Meeting and Greeting	Second part of wordlist in Prima A1 Arbeitsbuch (Jin, et al., 2007, p. 11) Translated in class by teacher A or B	• Class test set by teacher B • <u>In the examination:</u> Learners are asked to translate a word or phrase from or into German, and to provide the correct article for the nouns.
Start with vocabulary for Unit 2: My Class	First part of wordlist in Prima A1 Arbeitsbuch (Jin, et al., 2007, p. 19) Translated in class by teacher A or B	• Class test set by teacher B • <u>In the examination:</u> Learners are asked to translate a word or phrase from or into German, and to provide the correct article for the nouns.

Table 5.3 provides an overview of the learning content covered in the third term. It is important to note that this table only provides an overview of the already existing materials and assessments, and not the materials developed for the purposes of this study. Based on Table 5.3 the development of materials for the research is discussed in Section 5.3.

Table 5.3: Grade 8 German Learning Content for the Third Term

Content description	Materials	Assessment
Numbers in German	Additional notes (poem) compiled by teacher A. Prima A1 (Jin, et al., 2007, pp. 16,17) and audio.	• Oral exercise: Learners are asked to recite a poem (from memory) with the numbers 1 – 10. They are also asked to tell the class their phone number in German. • Exercises in Prima A1 Arbeitsbuch (Jin, et al., 2007, p. 14)
Verbs (*sein, heißen, kommen, wohnen, mögen, machen, hassen, spielen, haben*) with the conjugation for all the	Prima A1 (Jin, et al., 2007, p. 20) Additional notes compiled by teacher A	• Exercises in Prima A1 Arbeitsbuch (Jin, et al., 2007, p. 13) • Class test set by German teacher B. • <u>In the examination:</u> Learners are asked to provide the conjugated form of the verb in a sentence.

personal pronouns: *ich, du, er/sie/es, wir, ihr, sie/ Sie*.		
Talking about people and things	Prima A1 (Jin, et al., 2007, pp. 15,18,19)	- Learners are asked to write a piece about a friend of theirs, similar to the internet chat, but in the third person. - Exercises in Prima A1 Arbeitsbuch (Jin, et al., 2007, p. 13) - <u>In the examination:</u> Learners are asked to provide the correct conjugation of the verb for the third person.
Indefinite articles and possessive pronouns: *ein(e), mein(e), dein(e), kein(e)*	Prima A1 (Jin, et al., 2007, pp. 15,18)	- Class test set by teacher B - In the examination: Learners are asked to provide the correct form, *e.g.* of *mein/meine* for a specific noun.
Introduction to the accusative case: Using masculine nouns with *haben*.	Prima A1 (Jin, et al., 2007, p. 23)	- Exercises in Prima A1 Arbeitsbuch (Jin, et al., 2007, pp. 21,22) - In the examination: Learners are asked to provide the correct form of the article or possessive pronoun in a sentence with *haben*.
Complete vocabulary for Unit 2: My Class	Second part of wordlist in Prima A1 Arbeitsbuch (Jin, et al., 2007, p. 19) Prima A1 (Jin, et al., 2007, p. 18) Translated in class by teacher A or B	- Class test set by teacher B - <u>In the examination:</u> Learners are asked to translate a word or phrase from or into German, and to provide the correct article for the nouns.
Start with vocabulary for Unit 3: Animals	First part of wordlist in Prima A1 Arbeitsbuch (Jin, et al., 2007, p. 27) Translated in class by teacher A or B	- Class test set by teacher B - <u>In the examination:</u> Learners are asked to translate a word or phrase from or into German, and to provide the correct article for the nouns.

5.2.3. Time Frame and Learning Sequence

The period of implementation runs alongside the third school term of 2014 (from 21 July 2014 until 3 October 2014). During the implementation period, learners are given weekly

assignments. The scope of the materials developed for this study is based on Table 5.3 containing the learning content for the third term. An overview is given below of the scope of the class activity and homework assignments for each week.

Week 1:   **21 July 2014 – 27 July 2014**

Class activities: Learners receive their examination scripts from the previous term and these are discussed. Queries regarding marks are handled within this week and learners' marks are finalised for their report cards.

Homework assignments: During this week learners are given instructions for working on Moodle. As some other courses also make use of Moodle content, each learner already has an account on Moodle. Learners are expected to sign in to Moodle, and enrol for the German course. Any signing in or technical difficulties should be handled during this week.

Week 2:   **28 July 2014 – 3 August 2014**

Class activities: Teachers provide an overview of what has been done up to now. Concepts that learners had difficulties with in the examination are explained again. Teachers start with Unit 2: *Meine Klasse* in Prima A1 (Jin, et al. 2007) and explain what will be taught in this Unit.

Homework assignments: Learners are given revison exercises of the work done in the first two terms.

Week 3:   **4 August 2014 – 10 August 2014**

Class activities: Teachers should continue with Unit 2 in Prima A1 (Jin, et al. 2007). The topics discussed in class should be related to *Meine Klasse* (My Class). Whereas the previous term was focused on talking about myself (*Ich heiße…, Ich komme aus…. Ich mag…*), these lessons should explain how to talk about someone or something else. One of the lessons should consist of explaining numbers and counting in German. Content of the textbook Prima A1 (Jin, et al. 2007, pp. 15-19) is covered during this week.

Homework assignments: Learners receive assignments covering the content of 'Talking about people and things'. Assignments should also include exercises about numbers in German. Learners receive a poem to learn by heart to remember the numbers from one to ten. Each learner is given the opportunity to recite the poem during the last lessons of the term.

Week 4:   11 August 2014 – 17 August 2014

Class activities: Teachers should finish with Unit 2: *Meine Klasse* in Prima A1 (Jin, et al. 2007). The lessons of this week should focus on vocabulary for school stationery. The the fact that nouns may have one of three different articles (*die/der/das*) should be emphasised once again. Learners should also be reminded that nouns are always written with a capital letter in German. When learners seem comfortable with the different articles of the nouns, they are introduced to the use of indefinite articles (*ein/eine*) in the same lesson they are introduced to possessive pronouns (*mein/meine* and *dein/deine*). Teachers should ensure that learners know when *mein* is used and when *meine* is used. Content of the textbook Prima A1 (Jin, et al. 2007, pp. 15,18) is covered during this week.

Homework assignments: Learners receive assignments covering the topic of stationery used in the classroom. Exercises are provided where learners determine whether to use *e.g. mein* or *meine* in a sentence. Learners should prepare for a class test on the vocabulary for stationery, the correct articles and the correct indefinite articles for each noun.

Week 5:   18 August 2014 – 24 August 2014

Class activities: In these lessons the plural personal pronouns *wir*, *ihr* and *sie* are introduced and the conjugation of the verbs used up to this far is explained for all the personal pronouns. The verb *haben* is introduced and the conjugation explained for all the personal pronouns. Content of the textbook Prima A1 (Jin, et al. 2007, pp. 20,23) is covered during this week.

Homework assignments: Learners receive assignments covering the use of all the personal pronouns.

Week 6:   25 August 2014 – 31 August 2014

Class activities: During this week, learners are expected to take part in the Grey College Music Festival rehearsals. This means that contact periods are shorter and many learners are absent. Furthermore, since this week is more or less in the middle of the term, this week is dedicated to revision of what has been done up to so far.

Homework assignments: Learners are expected to revise what they have done and make sure that any outstanding assignments for the previous four weeks are handed in.

Week 7: **1 September 2014 – 7 September 2014**

Class activities: Teachers start with Unit 3: *Tiere* in Prima A1 (Jin, et al. 2007). Introduce the word *kein/keine* and explain that the same principle of when *kein* is used and when *keine* is used, as was explained in a previous week for the indefinite articles and possessive pronouns. The verb *haben* and its conjugation is explained again. Learners should now be able to conjugate any of the verbs covered for all the personal pronouns.

Homework assignments: Learners are given exercises to practice the conjugation of the verbs covered. Special attention is paid to *haben*. Exercises also contain questions regarding the use of *kein/keine*.

Week 8: **8 September 2014 – 14 September 2014**

Class activities: Teachers start with the introduction to the accusative case. The teachers suggest to only introduce this case by explaining that when a masculine noun (or '*der*' noun) is used with *haben*, the *der* changes to *den*, *ein* to *einen*, *etc.* Learners should be able to know that this is not the case when using the verb *sein* for example (in other words the nominative case). These terms (*Nominativ* and *Akkusativ*) will be explained in the fourth term, but learners should just know that *der* changes when used with *haben* for the third term's examination.

Homework assignments: Learners should practice the use of *haben* with *der* in a sentence, and be able to provide the correct article in a sentence. Exercises should consist of questions with masculine, as well as feminine and neutral nouns.

Week 9: **15 September 2014 – 21 September 2014**

The September examination for Grades 8-10 start on Tuesday 16 September. During the examination period, learners are still expected to attend class. However, during this period, the academic days are shorter and only four periods are taught per day (as opposed to eight on a normal school day). This means that there are fewer German periods during these last three weeks.

Class activities: In the German classes during the examination, learners are expected to present the oral exercises and continue with revision for the examination. During the first week of examinations, teachers can discuss the revision of examinable content from the first and second terms.

Homework assignments: The homework assignments consist of revision work of the first and second terms.

Week 10: 22 September 2014 – 28 September 2014

Class activities: Learners present the oral exercises and continue with revision for the examination. During the second week of examinations teachers can discuss the revision of 'new' content that was introduced during the third term.

Homework assignments: The homework assignments consist of revision work of the third term.

Week 11: 29 September 2014 – 5 October 2014

On Tuesday 30 September 2014, Grade 8 learners write the September examination for German. On Monday 29 September, learners are encouraged to meet with the teachers who are available throughout the afternoon, if learners should have any questions. During this week there are no homework assignments.

(Adapted from the Grade 8 Learning Content Planning for the third term as discussed at the Subject Meeting on 21 July 2014)

5.2.4. Additional Features of Online Learning Material

 This study is conducted to determine whether the medium through which the homework is done, makes a difference to the learners' performance and motivation in the subject. The content and the sequence of the assignments for the two groups are, therefore, the same. However, in order to determine whether the online method makes any significant difference in the learners' performance, there should be some differences between the assignments of the two groups. The main additional features of the online learning materials are outlined below.

1.   Access to online glossaries

The learners in the Moodle group will have access to all the glossaries loaded onto Moodle, while the learners in the control group will have printed word lists that will not be updated after they have received the lists. Although both lists will contain the same entries initially, the possibility exists that online glossaries can be updated throughout the implementation period.

The auto-linking function of the Moodle glossary module will be used. This means that learners in the Moodle group will be able to access the definition or translation of a glossary entry by clicking on the word from within some quizzes and lessons. Learners in the control group will have to search for the words in the word lists.

The glossaries on Moodle also provide the opportunity of including sound clips. These glossaries will therefore contain the pronunciation of the entries, while the word lists for the control group will not.

2.   Access to audio and other multimedia files

Different types of multimedia files, such as audio clips and video clips, can be included in the content of the Moodle group's assignments. Learners can be asked to answer questions by listening to a text, or watching a video. Learners in the control group will only have access to written texts.

3.   Immediate feedback

When completing a quiz or a lesson on Moodle, the learners receive immediate feedback on their answers. Learners can therefore immediately identify their mistakes, learn from them, and in some cases correct the mistakes and resubmit the assignment. The learners in the control group will have to wait to receive their graded assignments from the teacher, and will not have the opportunity to correct the mistakes as might be the case for the Moodle group.

4.   Multiple attempts

Whereas learners in the control group will only be allowed to submit their assignments once, learners in the Moodle group will have the opportunity to re-attempt quizzes, lessons and games to improve their marks, after receiving feedback on their answers.

5.   Games and random entries in games

Whilst games like Crossword and Cryptex can be included in the assignments for the control group, the other games used in the Moodle assignments (Hangman, Millionaire, Hidden Picture, Snakes and Ladders and Sudoku) cannot be incorporated in the assignments for the

control group. This is mainly because these games depend on the learners' answers to continue to the next question or step in the game.

Should the games like Crossword and Cryptex be used in the control group's assignments, all the learners will receive the same questions. In the Moodle group, the questions are randomised and the learners all receive different questions in the games.

Despite the differences between the assignments of the two groups, the content will remain similar and will be delivered in the same sequence across the groups. An explanation is now given of how the materials for the Moodle group were compiled.

5.3. Phase 2: Development of Learning Materials

This section broadly describes how the assignments the Moodle group were developed. It is important to note that all materials developed were based on the current textbooks used at Grey College, on instructions provided by the Grade 8 German teachers of the school, and on the already existing materials for the control group.

When creating learning materials in Moodle, there are many different methods of delivery. The modules that are used are described in Section 5.2.1. A brief discussion of how each of these modules are used to develop learning materials is now given.

The Forum module does not form part of the development of the learning materials. Still, this module is often used for announcements or questions or issues raised by the learners – these issues mostly relate to technical difficulties. The teacher creates the discussion forum, provides it with a title and description of what learners can expect to read in the forum. Should the learner then wish to contribute to the forum, he can reply on a post created by the teacher, or he can create his own topic of discussion within the discussion forum. Figure 5.2 shows an example of the forum created for raising questions.

Figure 5.2: Screenshot of Discussion Forum

Glossary Module

The Glossary module is used to create wordlists for the learners. The wordlists are based on wordlists in the learners' textbook, Prima A1 Arbeitsbuch (Jin, et al. 2007a). The steps in creating the glossaries for this course are outlined below.

A title for the glossary is chosen. This is usually similar to the wordlist described in the learners' Arbeitsbuch (Jin, et al., 2007). The corresponding chapter number and name in the textbook are used in the glossary title. Mostly, a brief description of the glossary – whether it includes audio and pictures or what its purpose is – is also given.

For the materials of this course, all glossary settings are the same: Learners are not able to comment on entries, but all entries will be automatically linked. (The auto-linking of entries is switched off when the glossary is solely created for the purpose of a game or quiz.)

The entries are structured as follows: The *concept*-field is the German word that is described. The *definition*-field provides the English and Afrikaans translation of the word. If the word is a noun, the *definition*-field also includes the word with its article, and the plural of the word. If the concept is a verb, a table is provided with its conjugation for all the personal pronouns. In many cases, the *definition*-field also contains a sound clip with the word's pronounciation, and a picture. The sound clips are downloaded as mp3s from www.forvo.com (Forvo, 2014),

while the pictures, in jpeg or gif format, are obtained from Microsoft Office Online Clipart (Microsoft Office, 2014) Pictures can also be added as attachments – and not within the definition field. This is useful in when the glossary is used for a game like The Hidden Picture.

Figure 5.3 shows an example of one of the glossary entries, if learners click on the media player bar, they will hear the pronounciation of the word '*Adresse*'.

Figure 5.3: Screenshot of Glossary Entry
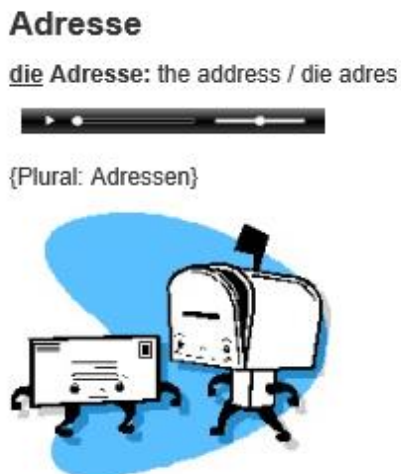
Figure 5.4 shows an example of the auto-linking function of the Glossary. Inside this quiz, the learner clicks on the word '*auch'* for which the auto-linking setting was turned on. A pop-up appears showing the glossary entry for *auch*, with the English and Afrikaans translation and a media player bar for the pronounciation.

Figure 5.4: Screenshot of Auto-Linking Function
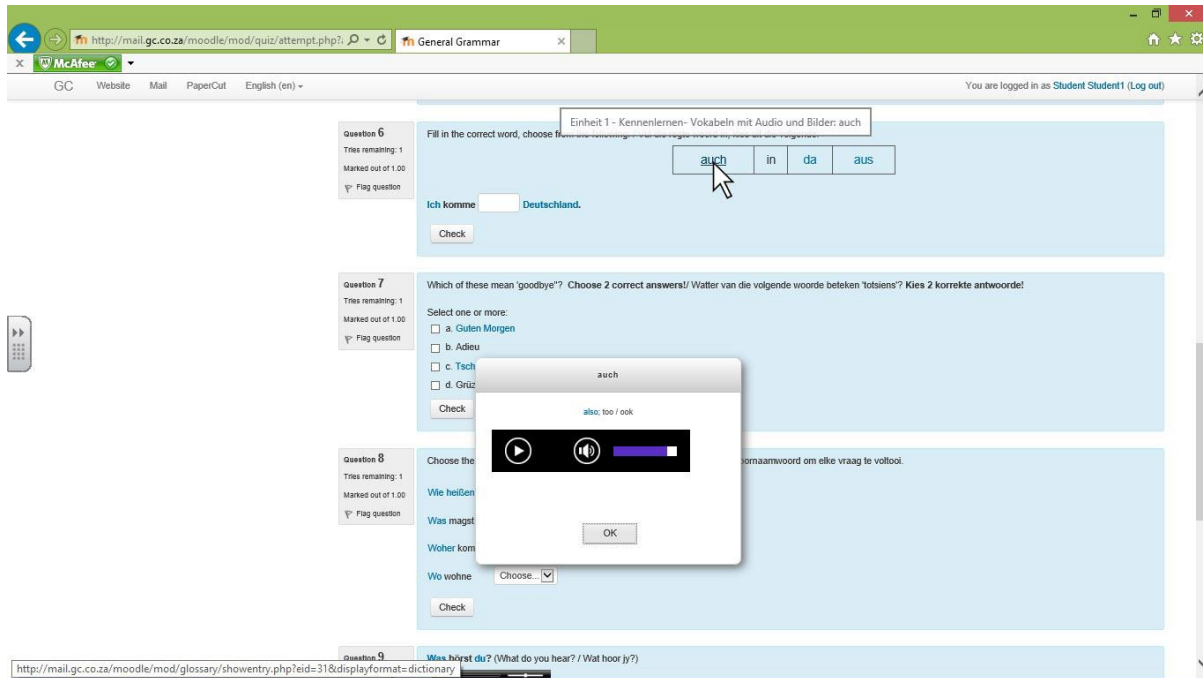
Quiz Module

Quizzes for each week are created to assess the learners on the content covered in class and in the lessons. The quiz is given a title that reflects the content, and the description provides an overview of what is covered in the quiz. Multiple choice, matching, short answer and true or false questions will be used in the quizzes. The question behaviour for all questions will be set to Adaptive mode with no penalty. This means that a learner can check the correctness of his answer and then submit another answer if his initial answer was wrong.

All questions created for the quiz are saved in the question bank. Questions are therefore given titles that reflect the type of question as well as the content assessed. For example, the question 'verb01mc' describes the first question on verbs and that it is a multiple choice question.

For this course no essay type questions are included in the quizzes. This means that learners receive their marks immediately after submission. Learners are allowed 3 attempts and the quizzes are set to use the highest grade of all 3 attempts.

Figure 5.5 shows the immediate feedback of Adaptive mode in a quiz. In the first part, the learner clicked on 'check' and saw that he answered incorrectly. He can then click on the

wrong answer and type in the correct answer and click on 'check' again, as shown in the second part.

Figure 5.5: Example of Adaptive Mode in a Quiz

Lesson Module

Lessons are created based on work done in the class every week. The lesson is given a title and the teacher determines the settings in terms of time limit, prerequisite lessons and grade administration. The settings for all the lessons for this course are the same: No prerequisite lessons, no limit on number of attempts and the grade used is the maximum grade obtained. In some cases learners may be allowed to resubmit a wrong answer within the lesson, but in most cases the learners will have to redo the entire lesson to improve their marks.

The lessons start with an introduction or overview of what is covered in the lesson. The content pages are usually in both English and Afrikaans, or there is a different lesson path for each of the languages. The content pages can contain sound clips or picture files. Often, a content page is created in Microsoft PowerPoint, saved as a jpeg file and uploaded as a content page. These content pages are more attractive, but interactivity is limited and the auto-linking function of the glossaries does not work with words on these pages.

After a few content pages, a question or a cluster of questions is included and learners have to answer correctly to be able to progress to the next page. Learners are awarded a grade for

the lessons immediately. For essay type questions, the learners' grade is updated after the teacher has marked the question.

The following figure represents the lesson where the accusative case is introduced. At the teachers' request, this lesson is not called '*Akkusativ*', but referred to as "*haben mit 'der' Nomen"*. Figure 5.6 represents the title page of this lesson. The two buttons at the bottom gives the learner the opportunity to continue with the lesson in either English or Afrikaans.

Figure 5.6: Screenshot of Title Page of Lesson

Game Module

The Game module uses already defined questions from the question bank, or entries from glossaries to create games. Because some of the glossary entries contain the concept within the definition (*e.g.* a table with the conjugation of the verb) sometimes glossaries are defined for use explicitly in the games.

When the source glossary or question bank category for the game has been defined, the teacher specifies the maximum grade and time limit, should there be one, and the game is created. Figure 5.6 shows an example of a Snakes and Ladders game. The game is based on the glossary for *Schulsachen* (stationery). The learners are provided with a picture of a pair of

scissors and the English and Afrikaans translation for the word. They need to answer '*die Schere'* and the die will be rolled so that they are able to move forward on the board.

Figure 5.7: Screenshot of Snakes and Ladders Game
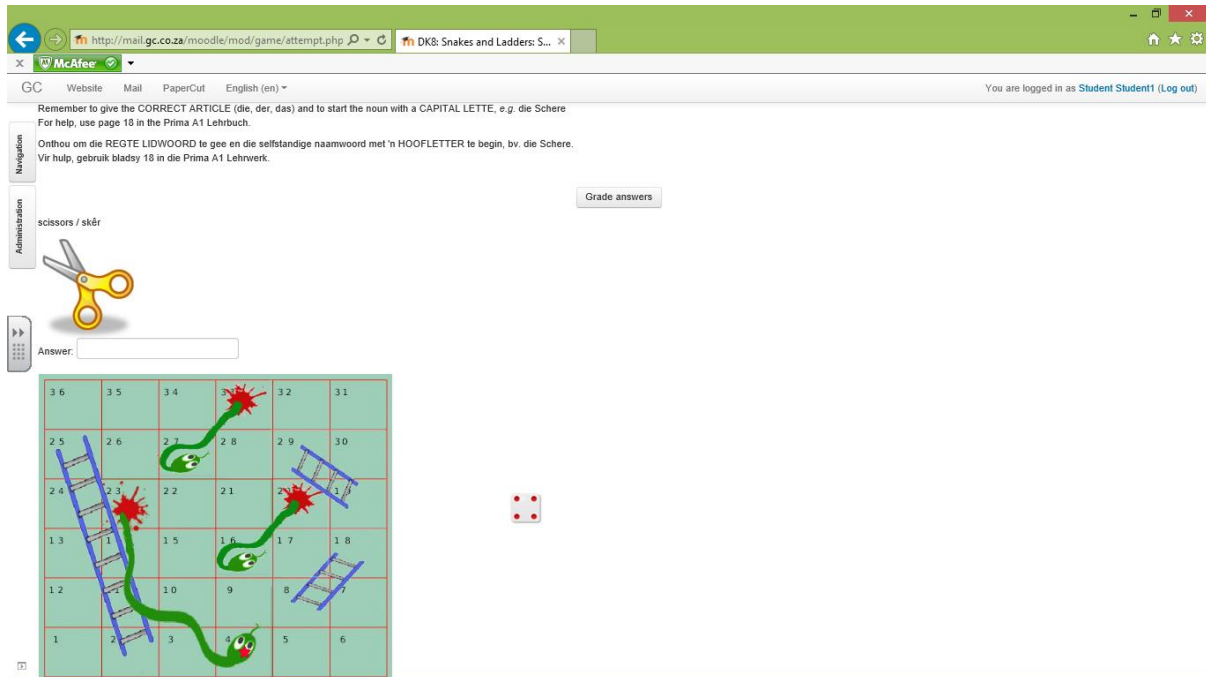
During the week of 29 September – 3 October, before the final examination is written, the chat module is used for issues and questions about the examination work. The teacher is available for a session of two hours and learners can post any questions relating to the examination work, to which the teacher will respond immediately.

 A detailed description of the weekly Moodle assignments is given in Appendix B.

5.4. Phase 3: Approval of Developed Materials

After materials are created, they are first presented to the Grade 8 German teachers and the German Subject Head at Grey College for review. The teachers decide on the suitability of the materials for the course and approve the implementation of the materials into the learning plan.

The implementation of the materials is evaluated by comparing the learners' examination marks in the third term to their examination marks in the second term. The next chapter provides an overview of the results of this study.

Chapter 6 - Outcome of Research

6.1. Introduction

In Chapter 4 the methods used for the analyses are discussed. These analyses are based upon the data following a normal distribution. Therefore, before commencing with any tests, all data are tested for normality, by performing the Shapiro Wilk test and constructing a QQ-plot.

Once normality is confirmed, three tests are performed on the data: an F-test for equal variances between groups, a t-test for equal means between groups and for multivariate data Hotelling's T^2 test.

The assumption that learners' interest in German as a foreign language is not a variable that may bias the results of the study, is confirmed by conducting an informal survey at the beginning and at the end of the study period. The results of the survey are not analysed statistically. The goal of this survey is just to describe the environment and provide certainty that motivation, from the perspective of the learners, is not a variable that might influence the results of this study.

The total number of learners included in the study is 129. To compare the results of the survey at the different time points, Table 6.1 provides a summary of the number of learners who answered the questions positively, i.e. rated each of the four questions with three or higher. The table also contains the number of learners indicating that they consider continuing with German after Grade 9.

Table 6.1: Number Positive responses

	"How are you enjoying German Classes?"	"How are you enjoying the German homework?"	"How well do you understand the German classes?"	"Do you like the German language?"	"Do you plan to continue with German after Grade 9?"
First survey	129	121	129	128	84
Second survey	126	118	127	124	64

At the beginning of the study, there was clearly no problem with the learners' interest in German. Over the duration of the study there seems to have been a decrease in the positive responses, but only by a small factor. It is therefore assumed that the learners' interests will not influence their performance and will therefore not interfere with the results for this study. The influence of the learners' interest and motivation in German is therefore not included in the analysis on their performance.

The datasets that are used for the analyses are those obtained from the students' results for the exam and results for the continuous assessment. It is, however, important to take into consideration the fact that the datasets are not the same in reality as was expected. An overview of the unexpected elements of this study is given in the following section.

6.2. Difference between Expectation and Reality

The theory for this study has been outlined clearly. However, as this study is concerned with humans and not simulated data, this study would hardly be authentic if there were not some elements that contribute to the discrepancies between expectation and reality. This section outlines a few of these elements.

The study uses the data from four Grade 8 classes, two English classes and two Afrikaans classes. The classes are also taught by two different teachers. The total number of learners in these four classes is 147.

When learners signed up for the Moodle group at the beginning of the third term, 73 enrolled for the Moodle course and 74 learners were included in the control group. A t-test was done that compared the results from the second term examination for the Moodle group with that of the control group. This test showed that the two groups were statistically similar. Throughout the term, however many changes occurred to the structure of these groups.

By the end of the third term 18 of the learners moved from the Moodle group and decided to complete all assessments as part of the control group. These learners are now included in the control group.

Eighteen students have been excluded from the analysis completely. Three of these students started in the Moodle group, and completed some exercises on Moodle and the rest conventionally. Since the focus of this study is on learners completing all assessments in either

one of the groups these three have been excluded. Nine students from the Moodle group are excluded from the study: two students who did not write the first examination; three students who did not write the second examination, the three students that did some assignments in Moodle and some conventionally, and a student who did not submit any assignment on Moodle, and did not hand in any written assignments. Nine students from the control group are excluded from the study: three students who did not write the first exam and six students who did not hand in any assignments throughout the term.

This means that, by the end of the third term, the Moodle group consists of 46 learners, and the control group of 83. These learners' results constitute the final dataset used for analyses. A t-test is conducted again to ensure that the final groups in the study are still statistically similar.

Another element contributing to the difference between the expectation and reality concerns the question of missing data. From the 83 learners in the control group, 21 learners did not submit all their assignments. Nineteen out of the 46 Moodle learners had at least one assignment outstanding. According to the teachers, when a learner does not submit an assignment, he is summarily awarded a grade of zero for that assignment. However, for the purposes of this study, a zero grade and a 'not submitted' are handled differently. For the analysis of the results of the individual assignments, Hotelling's T^2 test is performed. This test requires that there are no missing values for any of the variables. For this analyses, therefore, only learners who completed all assignments are included.

The last element that provides for another interesting turn in this study, concerns the continuous assessment exercises. All the learners were given homework covering the same content. There is, however, a difference between the mark allocation for the Moodle group and the mark allocation the teachers determined for the control group. The learners in the control group were given six assignments, that were graded separately, and the marks recorded. The learners in the Moodle group received various smaller assignments, covering the same work. The grades for the control group are therefore categorised for six assignments, whereas the learners in the Moodle group received eleven smaller exercises.

It is worth noting that for the purposes of this study not all the results of assignments on Moodle and for the control group were used for analysis. The teachers identified the six control group exercises that were graded, and there are eleven Moodle exercises

corresponding to the control group exercises. The decision is made to group the Moodle exercises into six assignments – covering the same content than the six assignments done by the control group. This can be done, as the same content is covered, and the learners had the same amount of time to complete the assignments in the control group and the smaller exercises in Moodle. By grouping the Moodle exercises, the variance in the marks is sure to change. However, the Hotelling's two-sample T^2 test is robust to changes in variance, and the grouping of the results will therefore not make a significant difference to the analysis.

6.3. Statistical Analyses

In this section, results from the different statistical analyses are discussed. An overview of the initial analyses is provided first. The analyses of the continuous assessment and the examinations are then discussed. All data analyses are performed using the programming software package, R (R Core Team, 2014).

6.3.1. Initial Analysis: Normality and Similarity of Groups

Before being able to perform tests described in chapter 4, it is important to determine whether the examination results of the learners follow a Normal distribution. This is done by performing a Shapiro Wilk test, and constructing a Q-Q plot of the data.

The Shapiro Wilk test yields a p-value of 0.001091 which means that, at a significance level of $\alpha = 0.05$, the hypothesis of normality is rejected and it is concluded that the data do not follow a normal distribution. The Q-Q plot to test for normality is shown in Figure 6.1.

Figure 6.1: Normal Q-Q Plot for Results from Examination 1
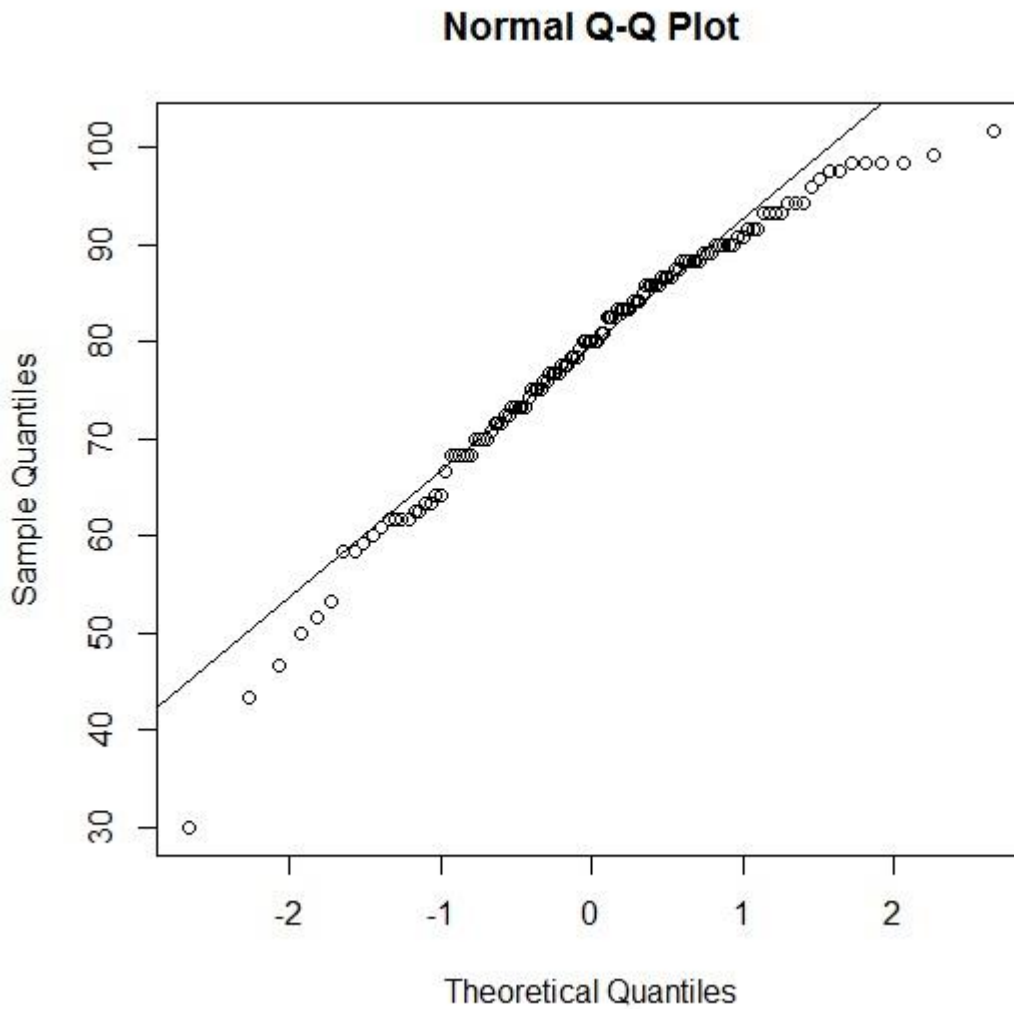
Normal Q-Q Plot

The QQ-plot also indicates that the data deviate from a normal distribution, especially for the small and large values.

It is still possible to perform t-tests on data that do not follow a normal distribution, provided that the data follow a relatively symmetrical distribution, the mean is close to the median, and the dataset only has one mode. To determine whether the distribution of the data is symmetrical, a histogram is constructed. Figure 6.2 shows the histogram for the results for Examination 1.

Figure 6.2: Histogram of Results for Examination 1
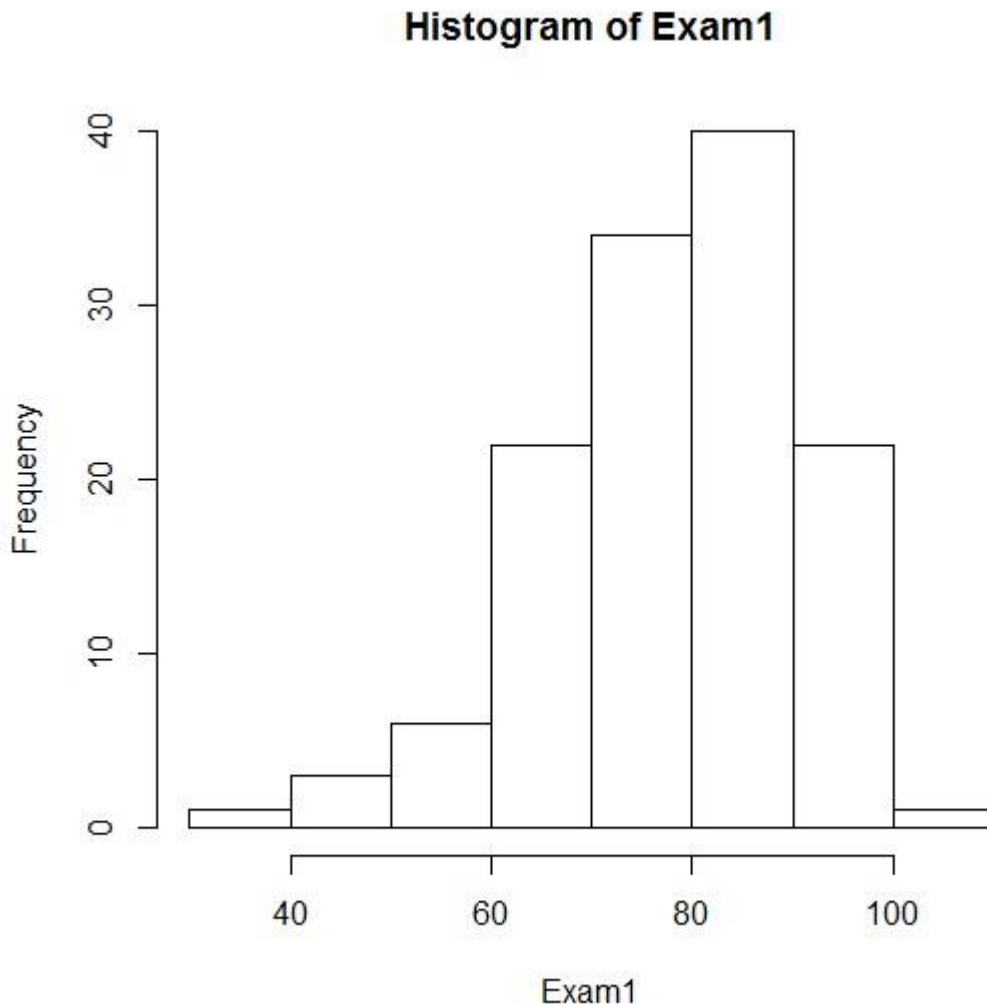
Although the distribution of the Examination 1 results is somewhat skewed, the mean of 78.83 is reasonably close to the median of 80, and there is only one mode with a value of 88.33. It can be concluded that, although the data do not follow a normal distribution, the suggested F-test and t-test may be performed.

It is important to determine whether the two groups of interest, i.e. the Moodle and control group are statistically similar. To do this, an F-test is performed to determine whether the variances of the results for each group are similar. The p-value resulting from using the var.test function in R (R Core Team, 2014) is 0.2569 which is larger than the significance level of $\alpha = 0.05$. This means that there is not enough evidence to reject the null hypothesis of no difference between the variances.

The variances are therefore assumed to be equal and a t-test is performed to determine whether the means of the results for each group are similar. The p-value obtained from the t.test function in R (R Core Team, 2014) with the var.equal option set to "TRUE", is 0.1455. This p-value is larger than the significance level of $\alpha = 0.05$ and the null hypothesis of equal means is not rejected.

There is not enough evidence to reject the null hypothesis of no difference. It is therefore concluded that these two groups are statistically similar. Although the learners were not picked at random, this does not seem to cause a biased situation that could influence later analyses. The statistical analyses on the learners' results during the third term are now analysed, based on the assumption that the groups are statistically similar in terms of German performance.

6.3.2. Statistical Analyses on Learners' Homework Grades

In this section, an analysis is done on the learners' homework grades. This analysis involves comparing the marks for all the individual assignments, while still considering the six assignments as paired observations from one learner. A Hotelling's T^2 test is performed, as the dataset contains multiple variables i.e. the six homework assignments.

Since Hotelling's T^2 test is based on the assumption that the underlying data follow a normal distribution, it is suggested to test for a multivariate normal distribution in the data. A Q-Q plot is constructed, comparing the quantiles of the multivariate data to the quantiles of a normal distribution, using Mardia's Multivariate Normal test (Rencher, 2002, p. 98). Figure 6.3 shows the Q-Q plot constructed by using the mardia.Test function of the MVN package in R (R Core Team, 2014).

Figure 6.3: Q-Q Plot of Mardia's Test for Multivariate Normality of Assignment Grades
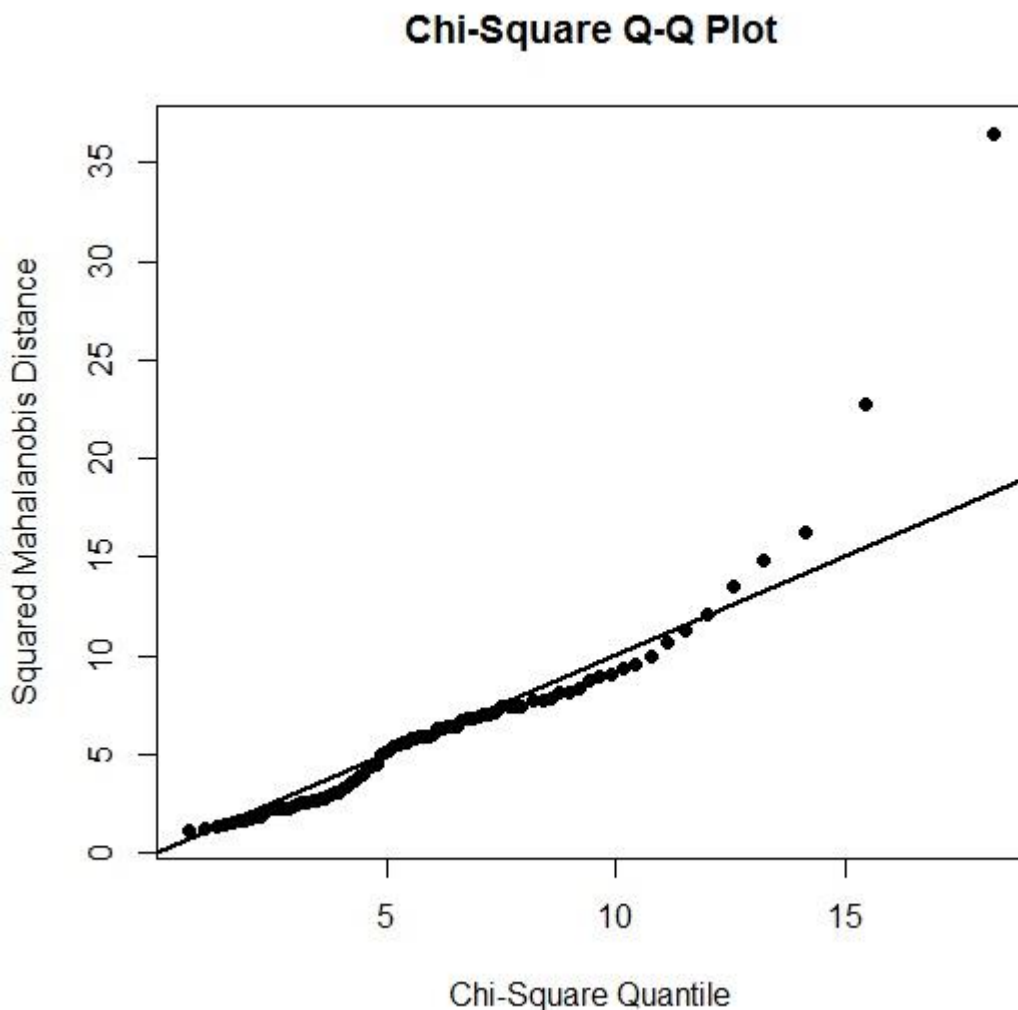
Chi-Square Q-Q Plot

From this Q-Q plot, it seems that there are observations that cause the data to deviate from a normal distribution. These few observations are considered outliers, and it seems that when they are disregarded, the data does not deviate significantly from a multivariate normal distribution. It is therefore valid to perform Hotelling's T^2 test on the data.

Since there is not an existing function in R (R Core Team, 2014) that performs this test, a short computed algorithm is written in the form of a function. The computed algorithm and all other programming code may be found in Appendix C. It is important to note that for this test, only learners who completed all the assignments are included. Learners who failed to submit one or more assignments are excluded from this analysis. The results of the Hotelling's T^2 test include a test statistic (8.3253) that is larger than the critical value (2.2113), and a p-

value that is smaller than 0.00001 and therefore much smaller than $\alpha = 0.05$. This means that there is a significant difference between the grades of the individual homework assignments for the two groups. A univariate t-test is then performed to test for a difference between the groups for each of the assignments. For these individual univariate tests, however, the significance level α should be adjusted (Rencher, 2002, p. 127). Rencher (2002, p. 127) suggests using the Bonferroni correction. Bland and Altman (1995) explain the Bonferroni correction, and indicate that if a series of k individual univariate tests are performed in a multivariate testing situation at a level of significance α, the significance level for each of these tests should be adjusted to $\frac{\alpha}{k}$. Using the Bonferroni correction, the new significance level for these univariate tests is $\frac{\alpha}{k} = \frac{0.05}{5} = 0.01$.

Table 6.2 provides a summary of the p-values for the individual F-tests and t-tests, the differences between the two groups in terms of mean grade of each assignment, and whether the differences are significant or not (bearing in mind that the new level of significance is now 0.01.

Table 6.2: Results from Individual Univariate Tests.

Assignment	1	2	3	4	5	6
F-test p-value	0.0002	0.0154	0.4242	0.0141	0.509	0.0032
t-test p-value	0.06255	0.0174	0.2741	0.0012	0.2601	0.0049
Difference (control – Moodle)	-0.9890	2.5318	-0.9391	-4.0884	-1.3321	1.4833
Significant difference	no	no	no	no	no	no

From the results it seems that although there was no difference between the individual grades of the homework assignments, when comparing the overall results for all the assignments a significant difference is observed. This is because neither of the individual means are far enough from the means of the other group to cause rejection of the null hypothesis. When however, the correlation between learners within the same group, is taken into consideration, the evidence to reject the null hypothesis for each of the observations is combined with that of another learner, and there is more evidence to reject the null hypothesis.

When the direction of the differences is taken into account, it seems that for three out of the five assignments, the Moodle group outperformed the learners in the control group. This may be attributed to the fact that learners in the Moodle group received immediate feedback in most of the cases and had the opportunity to re-attempt assignments until they were satisfied with their results.

An investigation into Assignment 2 brings to light that a question in the control group Assignment 2 was omitted by the teachers who marked the assignment, because many learners did not attempt that question. This suggests a possible reason for the control group outperforming the Moodle group, and this difference is therefore disregarded in this analysis.

Assignment 6 for the Moodle group consisted of an essay type question. Learners did not receive immediate feedback, but had to wait for the teacher to grade the answer online. This could suggest a possible reason for the control group outperforming the Moodle group in this assignment.

Although individual assignment grades did not show a significant difference between the groups, it is concluded that the overall homework grades were influenced positively by working on Moodle.

6.3.3. Statistical Analyses on Learners' Examination Results

For this section, it is important to emphasise that the analyses are not performed using only the examination results for the third term. The variables of interest are the differences between the second term and third term examination results.

Two analyses are done: Firstly, on the total difference between the two examinations and, secondly, on the difference on three different sections of the examinations: reading, vocabulary and grammar.

For the analysis on the overall examination difference, it is, again, assumed that the differences follow a normal distribution. A Shapiro Wilk test is conducted and a QQ-plot constructed. The Shapiro Wilk test yields a p-value of 0.6994 which is more than the significance level $\alpha = 0.05$. There is not enough evidence to reject the null hypothesis that the data follow a normal distribution. Figure 6.4 shows the Q-Q plot of the examination difference quantiles vs quantiles from a normal distribution.

Figure 6.4: Normal   Q-Q   Plot   for   Difference   between   Examination   1   and   Examination 2
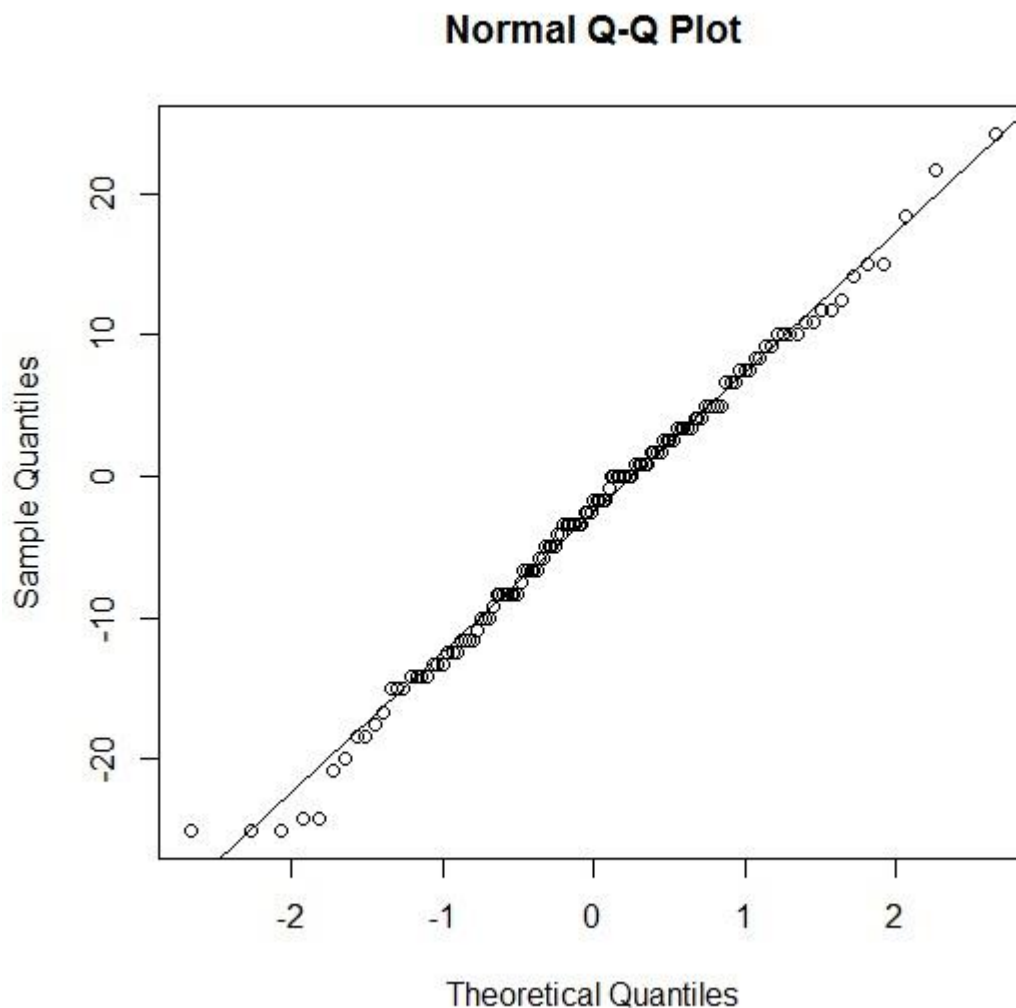
Based on the results from the Shapiro Wilk test and the Q-Q plot, it can be concluded that the total differences between Examination 1 and Examination 2 follow a normal distribution, and the F-test for equal variances and t-test for equal means can be performed.

For the analyses on total difference in examination results, an F-test is performed to determine whether the variances of the total differences for each group are similar. The p-value resulting from using the var.test function in R (R Core Team, 2014) is 0.08655 which is again larger than the significance level of $\alpha = 0.05$. The variances are assumed to be equal for the two groups.

A t-test is performed to determine whether the means of the total homework grades for each group are similar. The p-value obtained from the t.test function in R (R Core Team, 2014) with

the var.equal option set to "TRUE", is 0.2645. This p-value is much larger than the significance level of $\alpha = 0.05$ and the null hypothesis of equal means is not rejected.

There is not enough evidence to reject the null hypothesis of no difference. It is therefore concluded that the total difference between the results of Examination 1 and the results of Examination 2 are similar for the two groups.

The second analysis concerns the differences in the examination sections reading, vocabulary, and spelling. This analysis involves comparing the difference between all three examination sections, while still considering the exam as a whole. A Hotelling's T^2 test is performed, as the dataset now contains multiple variables (the 3 examination sections).

Since Hotelling's T^2 test is based on the assumption that the underlying data follow a normal distribution, it is suggested to test for a multivariate normal distribution in the data. A Q-Q plot is constructed, comparing the quantiles of the multivariate data to the quantiles of a normal distribution, using Mardia's Multivariate Normal test (Rencher, 2002, p. 98). Figure 6.4 shows the Q-Q plot constructed by using the mardia.Test function of the MVN package in R (R Core Team, 2014).

Figure 6.5: Q-Q Plot of Mardia's Test for Multivariate Normality of Assignment Grades
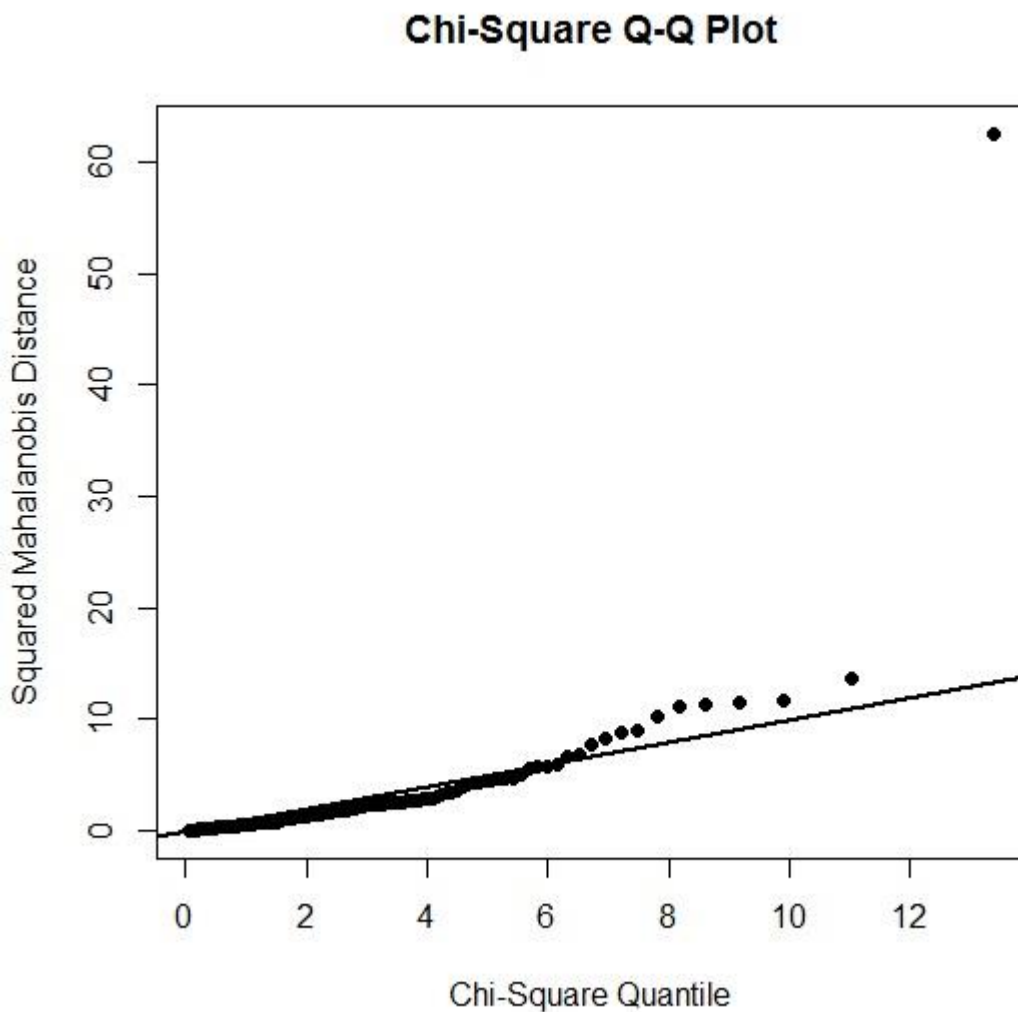
From this Q-Q plot, it seems that there are observations that cause the data to deviate from a normal distribution. These few observations are considered outliers, and it seems that when they are disregarded, the data does not deviate significantly from a multivariate normal distribution. It is therefore valid to perform Hotelling's T^2 test on the data.

Again, the computed algorithm is used to conduct this test. The results of the Hotelling's T^2 test include a test statistic (1.9339) which is smaller than the critical value (2.6771), and a p-value of 0.1275 that is larger than $\alpha = 0.05$. This means that there is no significant difference between the two groups in terms of the differences in individual examination section grades. There is no need to compare the difference for each examination section of the two groups

individually, as the null hypothesis of no difference between the groups is not rejected. This implies that neither for the overall examination grade, nor for the individual examination sections, a difference between the two groups was observed. It can be concluded that whether a learner was working on Moodle or not, did not affect his performance in the examination.

Chapter 7 - Discussion, Recommendations and Conclusion

7.1. Discussion

In the previous chapter the conclusion was drawn that the learners' performance in the examination is not influenced by whether or not they were doing homework on Moodle. However, their performance in homework assignments throughout the term is influenced by doing homework on Moodle. In this section, the impact of this conclusion on the answer of the research question is discussed.

The aim of this research project is to determine whether incorporating elements of a blended learning approach (with underlying theories of connectionism and constructivism) is useful in a school system using theories based on behaviourism and cognitivism and makes a significant contribution to the learning environment of the learners. In other words, this research aims to answer the question of whether it makes sense to incorporate the blended learning approach, without changing any other elements of instruction in the classroom.

The statistical results show that there is no significant difference between the performance of the Moodle group learners and the performance of the control group learners in their examination results. Although there is a significant difference in the learners' homework marks, this does not indicate that working on Moodle has helped them to learn better. The difference in their examination mark should give an indication of whether learners were able to learn better, and this difference does not seem to be influenced by whether or not a learner worked on Moodle through the term.

The cost of implementing the Moodle system into the learners' syllabus is high. Although no financial costs are incurred, compiling exercises in Moodle is a time-consuming process. To create highly interactive quizzes, for example, the teacher has to anticipate which responses learners might give, and then 'teach' the computer how to respond in each situation. For a teacher with absolutely no experience in programming, the learning curve is also higher. The researcher found that it was sometimes necessary to utilise knowledge of html programming when creating certain exercises (this was specifically the case when trying to create table borders in a lesson).

Calculating the cost, while taking into consideration that the implementation had no positive effect on the learners' performance in the examination, it seems that the implementation of a blended learning system without applying changes to a behaviourist teaching environment is not worthwhile.

The following section contains some of the lessons learned throughout this study. Suggestions where the implementation of a blended learning approach might yield better results are provided. Recommendations are made with regards to both the use of technology in education and research on technology in the language classroom.

7.2. Recommendations (Lessons Learned)

This section is structured into two parts. The first part of this section contains recommendations regarding the use of technology in education, and the second part concerns recommendations for further research in the use of technology in language education.

7.2.1. Recommendations Regarding Technology in Education

Should the decision be made to implement technology into a language education setting, in the form of a learning management system like Moodle, it is very important that both the teacher and the learners receive sufficient training in the system. Teachers should receive training on the development of materials, and learners should learn about handling assignments in such a system. It is also important to ensure that learners and teachers have enough time to understand. A single one hour workshop will not suffice; learners and teachers should be able to explore this new system over a period of time, when they have the opportunity to ask and learn.

Teachers should also have enough time to create and compile learning materials, in order to create optimal interactive content. The researcher has found, however, that learners need to have their time limited to complete assessments. When the learners know that they have much time to do an assessment, they rarely complete the assessment in time.

One is likely to assume that all 14-year old boys are technologically literate, that they intuitively know how to "post" or "comment on" a discussion board, because they are exposed to all forms of social media nowadays. However, the researcher finds that this is not

the case, and learners should be provided with clear instructions and the opportunity to ask questions when something is unclear.

7.2.2. Recommendations Regarding Research on Technology for Language Learning

This study shows that the implementation of a blended learning approach based on learning theories like constructivism, does not contribute to learners' performance when used only in conjunction with a teaching practice where behaviourist theories are prominent. It has been argued that for a beginner, behaviouristic theories of learning are sometimes preferred to more autonomous methods of learning based on constructivist theories. It is therefore recommended that such a study implementing a blended learning approach be applied to learners who have already gained some experience in a field, that is, where the learners do not only rely on the teacher to teach them, but are also capable of learning and exploring on their own.

For research purposes, a randomised study is preferred to a study where the groups are assigned based on willingness or ability. Randomising subjects into a group eliminates any possible biases resulting from variables that are not taken into account. When the sample size is large enough, such a study might produce more accurate results.

For more accurate results ample time should be given to test whether the implementation of a system contributed significantly. The short time span of this study might have limited the accuracy of the results.

7.3. Conclusion

This research aims to determine whether a significant difference in beginner learners' performance in German as a foreign language is manifested when combining conventional teaching methods, based on behaviourist learning theory, with online assignments representing an aspect of constructivist learning mechanisms.

The study emphasises statistical validity of educational research. The validity of the statistical tests performed in this study is based on assumptions that the data follows a normal distribution, and that there is no initial difference between the two groups.

The different statistical tests, performed on data consisting of learners' homework grades and examination results, show that the implementation of Moodle as an online learning platform into the beginner German learners' learning plan, does not lead to an improvement in their examination results. The implementation of Moodle did influence the learners' homework marks positively, and if the aim is to improve learners' marks throughout the term, such an implementation might be useful. The learners in the Moodle group outperformed the learners in the control group in terms of the continuous assessments throughout the term. This could be attributed to the fact that learners were able to resubmit assignments. However, performing well in the assignments throughout the term did not necessarily cause learners to do better in the examinations. This could imply that working on Moodle did not have a significant influence on their knowledge and understanding of the subject.

One could, therefore, conclude that the incorporation of selected aspects of blended learning does not result in a significant change in learners' German performance in terms of examination results in comparison to a control group, when no changes are effected to an already existing teaching methodology. The recommendation is that when aspects of blended learning are incorporated into teaching, the language pedagogy is reviewed to create an optimal learning environment.

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Appendices

Appendix A: Example of Survey to Determine Learners' Motivation

1. How old are you?				
2. What is your home language?				
3. What is your language of instruction at school?				
	Afrikaans		English	
4. Who is your German Teacher?				
	Mrs Greyvenstein		Mrs Strauss	
5. How are you enjoying the German classes?				
Waste of my time 1	Pretty boring 2	Okay 3	Sometimes fun 4	Super exciting 5
6. How are you enjoying the German homework?				
Waste of my time 1	Pretty boring 2	Okay 3	Sometimes fun 4	Super exciting 5
7. How well do you understand the German classes?				
I have no clue what is going on 1	I don't really understand much 2	I understand some of the work 3	I understand more than half of the work 4	I understand almost everything 5
8. Do you like the German language?				
Not at all – it's a terrible language 1	I don't really like it. 2	It's not too bad. 3	It's an okay language – it's rather cool 4	Yes, I think it's a great language 5
9. Do you plan to continue with German after Grade 9?				
	Yes		No	
10. Why do you think it is beneficial for you to learn German? _____ _____				
11. What do you enjoy the most about the German classes? _____ _____				

Appendix B: Weekly Online Learning Materials

The course on Moodle is structured by week. Learners are able to see the activities for each week. This appendix provides an overview of the learning activities on Moodle, and is also structured by week. Where necessary, screenshots are provided to show what learners see on Moodle. All screenshots are retrieved from the following website: http://mail.gc.co.za/moodle/course/view.php?id=193, except where indicated otherwise.

When learners are logged in to the Moodle course, Deutsch Klasse 8 (DK8), they find the home screen. From this screen, learners are able to access their grades, and all activities. They are notified of any changes or updates that occurred since their last log-in and reminded of any upcoming events.

A discussion forum is added on the home screen where learners are encouraged to ask questions or make suggestions for the course. A link to the LEO Online Dictionary www.leo.org is also available on this page. When learners click on this link, the LEO dictionary is embedded in the Moodle framework. Learners can therefore search for translations of words without having to leave the Moodle course.

Figure B1: Home Screen of the DK8 Course on Moodle

Week 1:   21 July 2014 – 27 July 2014

During this week learners are introduced to the German course on Moodle. Learners receive instructions for enrolling for the course, an overview of how the online assignments work, and a file containing alt codes for special characters used in German.

A YouTube video is embedded in the content for this week. This video depicts the winning goal of Mario Götze during the FIFA Soccer World Cup final. Figure B2 shows the screenshot of what learners see during this week.

Figure B2: Screenshot of Week 1: 21 July 2014 – 27 July 2014

Week 2:   28 July 2014 – 3 August 2014

Learners are provided with the glossary for Unit 1, and receive a lesson covering the work of the first two terms. Learners also have to complete a quiz on the work done previously.

Figure B3: Week 2: 28 July 2014 – 3 August 2014
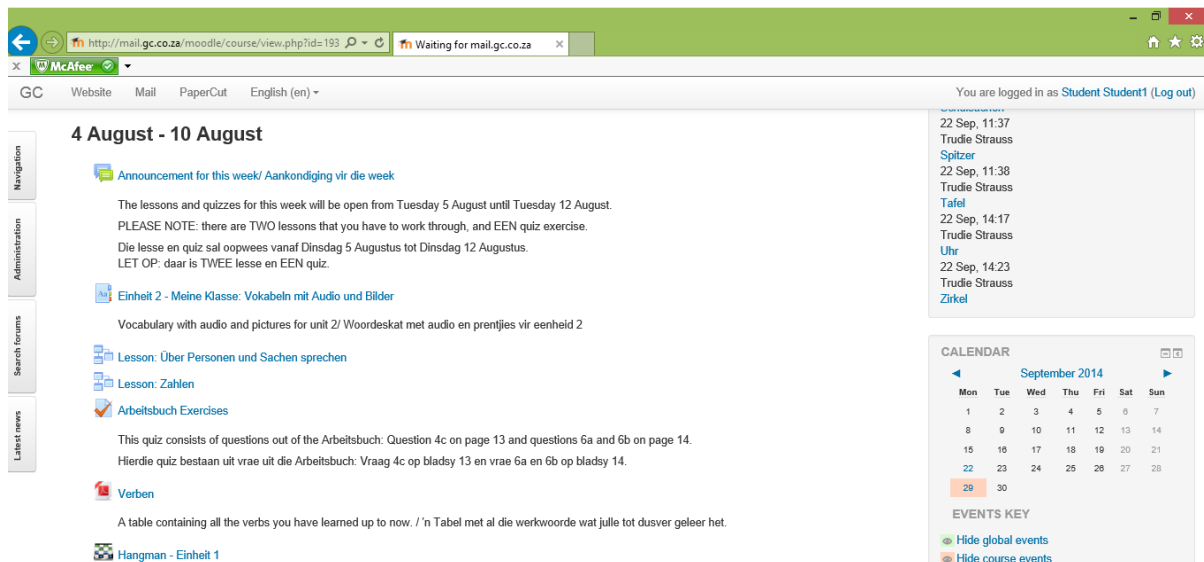
Week 3:   **4 August 2014 – 10 August 2014**

The glossary for Unit 2 is created on Moodle, as well as two lessons: *Über Personen und Sachen sprechen*, and *Zahlen*. The latter is only a practice lesson, and contains no question, so no grade is awarded for this lesson. The quiz for this week is based on two exercises in the Prima A1 Band 1 Arbeitsbuch (Jin, et al., 2007).

Learners are also introduced to the Game module. In this week learners play a game of Hangman. The questions of the game are based on the glossary for Unit 1.

Figure B4: Screenshot of Week 3: 4 August 2014 – 11 August 2014

Week 4:   **11 August 2014 – 17 August 2014**

During this week learners are encouraged to read the announcement before commencing with the assignments for the week. When they have read the announcement, they should post their names in a comment.

Two lessons are added this week: one explaining the vocabulary for school stationery and one to explain the use of the indefinite article *ein/eine* and the possessive pronouns *mein/meine* and *dein/deine*. An extra glossary is added containing only the vocabulary for school stationery, and learners are advised to make sure they know the words in this list before continuing with the Snakes and Ladders game about the stationery. The screenshot for this week can be seen in Figure B5.

Week 5: **18 August 2014 – 24 August 2014**

The lesson for this week contains an overview of all the personal pronouns and the verbs covered in the classes. The quiz contains questions covering personal pronouns. Figure B5 contains a screenshot showing the content of both Weeks four and five.

Figure B5: Weeks 4 and 5: 11 August 2014 – 24 August 2014

Week 6:   25 August 2014 – 31 August 2014

Since all learners are taking part in the Grey College Music Festival, no homework assignments are given during this week. An announcement is made on a forum post, stating that there are no homework assignments, but learners are responsible to make sure that all their previous assignments and homework are up to date. A YouTube video is embedded containing a song with different farm animals and their sounds. The next unit is about animals.

Figure B6: Screenshot of Week 6: 25 August 2014 – 31 August 2014

Week 7:   1 September 2014 – 7 September 2014

This week learners are provided with the glossary containing animal names. A lesson on the verb haben and the concept kein/keine is also done. Learners then have to continue with a quiz containing questions on verbs and conjugations. A pdf file containing a table with all the verbs covered in the course up to now, is also added. The example of this week's screenshot is shown in Figure B7 below.
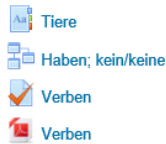
Week 8:   8 September 2014 – 14 September 2014

Homework assignments for this week consist of the lesson on the introduction to the accusative case. This lesson is called "*haben mit 'der' Nomen*". The next

lesson for this week is about plurals – but this is only in the scope for the next term and is not covered in the examination of the third term.

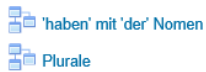*Figure B7: Weeks 7 and 8: 1 September 2014 – 14 September 2014*

1 September - 7 September

Aa Tiere

Haben; kein/keine

Verben

Verben

All the verbs we have done up to now. Al die werkwoorde wat ons tot dusver behandel het.

8 September - 14 September

'haben' mit 'der' Nomen

Plurale

Week 9:   15 September 2014 – 21 September 2014

During this week, learners start with revision exercises for the examination. Learners receive assignments that relate to the work done in the first two terms. The assignments include a revision lesson of writing the date in German, a quiz containing a reading and comprehension exercise and a game for the vocabulary of Unit 1.

Week 10: 22 September 2014 – 28 September 2014

In this second week of revision, learners revise the work done during the third term. The assignments learners receive include a quiz on all the verbs and personal pronouns, a quiz on the accusative case, a game with the vocabulary of Units 2 and 3, and a game containing questions that cover the entire course's content.

Week 11: 29 September 2014 – 5 October 2014

The content on Moodle for this week consists of a document containing the scope of the examination that is written on 30 September. A chat, using the Chat module, for questions is also created for Monday 29 September between 18:00 and 20:00, where the teacher will be available during these times.

Figure B8: Screenshot of Weeks 9- 11: 15 September 2014 – 5 October 2014

Appendix C: R Programming Code

StatsAnalysis_MATeLL.r

The following code was created in R (R Core Team, 2014) for the statistical analysis of the
data.

```r
#obtain data
setwd('C:/Users/Trudie/Dropbox/Research/MA TeLL/Data and Analyses')
AnData <- read.csv (file='AnalysisData.csv', header=T, sep=";", dec = ",")
#attach(AnData)

#Function to perform Hotelling's Two sample T-test.
HotellingT2twosample <- function(sample1,sample2) {
N1 <- nrow(sample1); N2 <- nrow(sample2)
n <- N1 + N2 -2
p <- ncol (sample1)
xbar1 <- colMeans(sample1); xbar2 <- colMeans(sample2)
A1 <- cov(sample1)*(N1-1); A2 <- cov(sample2)*(N2-1);
Sp <- (A1 + A2)/n
T2 <- (N1*N2)/(N1+N2)*t((xbar1-xbar2))%*% solve (Sp) %*% (xbar1-xbar2)
F <- T2/n*(n-p+1)/p
pvalue <- 1 -pf(F,p,(n-p+1))
Fcrit <- qf(0.95,p,(n-p+1))
return(list(p.value=pvalue,F.stat=F,F.crit=Fcrit, dif = (xbar1-xbar2)))
}

#convert analysis data to numeric format
Exam1 <- as.numeric(as.character(AnData$Exam1))
Exam2 <- as.numeric(as.character(AnData$Exam2))
Group <- as.numeric(as.character(AnData$Group))
Difflesen <- as.numeric(as.character(AnData$Difflesen))
Diffvokab <- as.numeric(as.character(AnData$Diffvokab))
Diffgramm <- as.numeric(as.character(AnData$Diffgramm))
Diffexam  <- as.numeric(as.character(AnData$Diffexam))
Assignment1 <- as.numeric(as.character(AnData$Assignment1))
Assignment2 <- as.numeric(as.character(AnData$Assignment2))
Assignment3 <- as.numeric(as.character(AnData$Assignment3))
Assignment4 <- as.numeric(as.character(AnData$Assignment4))
Assignment5 <- as.numeric(as.character(AnData$Assignment5))
Assignment6 <- as.numeric(as.character(AnData$Assignment6))
AssignmentTotal <- as.numeric(as.character(AnData$AssignmentTotal))


#determine whether Exam1 marks follow a normal distribution
#Shapiro Wilk test, and Create a qq-plot to test for normality
shapiro.test(Exam1)
qqnorm(Exam1)
qqline(Exam1)
#if not normal, determine whether symmetric, mean=median and one mode:
hist (Exam1, plot = T)
mean (Exam1)
median (Exam1)
Mode <- function(x) {
  ux <- unique(x)
  ux[which.max(tabulate(match(x, ux)))]
}
Mode(Exam1)
```

```
#Determine whether two groups are similar according to exam1 results
#variances equal?
var.test(Exam1[(Group == 0)], Exam1[(Group == 1)])
#means equal?
t.test(Exam1[(Group == 0)], Exam1[(Group == 1)], var.equal=T)

#Tests on continuous assessment results:
#Create matrices consisting of data from the 6 assignments:
#(IMPORTANT TO NOTE THAT ONLY COMPLETE ASSIGNMENTS ARE INCLUDED)
#All learners
Assignments <- c(Assignment1, Assignment2, Assignment3, Assignment4,
Assignment5, Assignment6)
Matassign <- na.omit(matrix(Assignments,length(Assignment1),6))
#Control group:
ControlAssignments <- c((Assignment1[Group == 0]),(Assignment2[Group ==
0]),(Assignment3[Group == 0]),
(Assignment4[Group == 0]),(Assignment5[Group == 0]),(Assignment6[Group ==
0]))
ControlMatassign                                                    <-
na.omit(matrix(ControlAssignments,length(Assignment1[Group == 0]),6))
#Moodle group:
MoodleAssignments <- c((Assignment1[Group == 1]),(Assignment2[Group == 1]),
Assignment3[Group == 1]),(Assignment4[Group == 1]),(Assignment5[Group ==
1]),(Assignment6[Group == 1]))
MoodleMatassign                                                     <-
na.omit(matrix(MoodleAssignments,length(Assignment1[Group == 1]),6))

#QQplot to test for multivariate normality
mnormal <-  mardiaTest(Matassign,cov=T,qqplot=T)

#Hotelling multivariate test to determine multivariate differences
HotellingT2twosample(ControlMatassign,MoodleMatassign)

#Individual univariate tests
var.test(ControlMatassign[,1], MoodleMatassign[,1])
var.test(ControlMatassign[,2], MoodleMatassign[,2])
var.test(ControlMatassign[,3], MoodleMatassign[,3])
var.test(ControlMatassign[,4], MoodleMatassign[,4])
var.test(ControlMatassign[,5], MoodleMatassign[,5])
var.test(ControlMatassign[,6], MoodleMatassign[,6])

t.test(ControlMatassign[,1], MoodleMatassign[,1], var.equal=F)
t.test(ControlMatassign[,2], MoodleMatassign[,2], var.equal=F)
t.test(ControlMatassign[,3], MoodleMatassign[,3], var.equal=T)
t.test(ControlMatassign[,4], MoodleMatassign[,4], var.equal=F)
t.test(ControlMatassign[,5], MoodleMatassign[,5], var.equal=T)
t.test(ControlMatassign[,6], MoodleMatassign[,6], var.equal=F)


#Test on Examination difference between Exam1 and Exam2:

#Shapiro Wilk test, and Create a qq-plot to test for normality
shapiro.test(Diffexam)
qqnorm(Diffexam)
qqline(Diffexam)

#Overall difference?
#variances equal?
var.test(Diffexam[(Group == 0)], Diffexam[(Group == 1)])
#means equal?
```

```r
t.test(Diffexam[(Group == 0)], Diffexam[(Group == 1)])
t.test(Diffexam[(Group == 0)], Diffexam[(Group == 1)], var.equal=T)

#Individual Differences from three exam questions
#Create matrices consisting of data from the Exam2 Differences:
#All learners
ExamDiffs <- c(Difflesen,Diffvokab,Diffgramm)
MatExamDif <- na.omit(matrix(ExamDiffs,length(Difflesen),3))
#Control group:
ControlExamDiffs  <-  c((Difflesen[Group  ==  0]),(Diffvokab[Group  ==
0]),(Diffgramm[Group == 0]))
ControlMatExamDif <- na.omit(matrix(ControlExamDiffs,length(Difflesen[Group
== 0]),3))
#Moodle group:
MoodleExamDiffs  <-  c((Difflesen[Group  ==  1]),(Diffvokab[Group  ==
1]),(Diffgramm[Group == 1]))
MoodleMatExamDif  <-  na.omit(matrix(MoodleExamDiffs,length(Difflesen[Group
== 1]),3))

#QQplot to test for multivariate normality
mnormal <-  mardiaTest(Matassign,cov=T,qqplot=T)

#Hotelling multivariate test to determine multivariate differences
HotellingT2twosample(ControlMatExamDif,MoodleMatExamDif)
```