



UNIVERSITY *of the*
WESTERN CAPE

**MULTILINGUAL TEACHER-TALK IN SECONDARY SCHOOL CLASSROOMS IN
YOLA, NORTH-EAST NIGERIA: EXPLORING THE INTERFACE OF LANGUAGE
AND KNOWLEDGE USING LEGITIMATION CODE THEORY AND
TERMINOLOGY THEORY**

BY

**MADU MUSA BASSI
STUDENT NUMBER: 3600470**

**A THESIS SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE
DEGREE OF DOCTOR OF PHILOSOPHY IN THE DEPARTMENT OF
LINGUISTICS, UNIVERSITY OF THE WESTERN CAPE.**

**SUPERVISOR:
PROFESSOR BASSEY E. ANTIA**

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Abstract

It has been noted by Lin (2013) that studies on multilingual talk, as illustrated by code switching in the classroom, have been repetitive and descriptive, and have for a while not been underpinned by substantially new or different questions (Lin, 2013:15). First, many of the studies in the literature have, for instance, concluded that there is a functional allocation of languages (FAL) in multilingual classroom teacher talk (e.g. Baker, 2012; Martin, 1996; Probyn, 2006, 2014; Jegede, 2012; Modupeola, 2013; Salami, 2008), such that language ‘a’ is used for presentational knowledge, and language ‘b’ is used for explanatory knowledge, and these claims have not been subjected to sustained scrutiny. Secondly, codeswitching and translanguaging increasingly have been the dominant and exclusive frameworks used, and this has limited the kinds of insights that can be obtained or the kinds of questions that can be posed. Thirdly, where the effects of multilingual teacher talk on students’ understanding or knowledge are at all captured in studies, such effects have either been based on researcher intuition or have not been the object of sustained empirical demonstration. Fourthly, many studies have assumed merely that it is the configuration of languages that produces claimed effects of multilingual teacher talk, and attention has hardly been paid to repetition of content or to knowledge structure. Fifthly, it is not often the case that studies or findings are presented in a nuanced form that takes into account the possible effect of different subject types, school types or levels of study. Sixthly, and overall, many studies making claims on the effect of teacher’s code-switching or translanguaging on students’ knowledge do not theoretically engage with knowledge, beyond the distinction between presentational and explanatory forms of knowledge, thus illustrating what Maton (2013) regards as “knowledge-blindness” (that is, the paradox of limited engagement with knowledge structures in pedagogical research making knowledge claims). As a result, little is known about how specific units of knowledge are encoded according to categories in a theory of knowledge, how knowledge encodings interface with languages, and how composite knowledge structures-language profiles can be visualised.

This study draws on Legitimation Code Theory Semantic and Terminology Theory in order to investigate the interface of language and knowledge in multilingual teacher-talk in science and business studies classrooms in Yola, North-Eastern Nigeria. This focus should make it possible to answer questions such as the following which, though important, have not often been posed on account of the limited engagement in the research on classroom multilingualism with theories of knowledge: a) to what extent is it appropriate to claim that

there is a functional allocation of language in multilingual teacher-talk (in which language ‘a’ is used for so-called presentational knowledge, and language ‘b’ for explanatory knowledge)?; b) what kinds of encodings of knowledge occur in a set of science and business studies lessons?; c) given documented visual patterns of knowledge dynamics emerging from recent research in the sociology of knowledge (e.g. semantic waves, semantic flatlines both high and low, downward shift and upward shift), (Maton: 2013, 2014a, 2014b), what knowledge profiles are observable and how does language use in multilingual teacher-talk map onto these patterns?; d) how are any observed differences in the composite knowledge-language profiles to be explained?; and e) what effects do various language-knowledge profiles have on students’ understanding of the lesson and on their demonstration of their knowledge? Data for the study was derived from transcripts of audio-recorded multilingual teacher-talk in two subjects (integrated science and business studies) as taught in grades seven and nine in four secondary schools (two private and two public schools) in Yola, North-East Nigeria.

Findings show, among others, that it is not always the case that the official classroom language (English) is used for introductory discourses, and the non-official classroom languages are used for explanatory discourses. Findings further reveal that it is not primarily the functional allocation of languages that explains perceptions or empirical claims of enhanced student understanding. We also observed that the number of content iterations, combined with knowledge structures, is an important factor that enhances or explains the performance of students.

While this research has paid a lot of attention to teacher talk in the classrooms in two sites in Yola, North-East, Nigeria, where the use of Hausa and Fulfulde languages by the students is mainly in the spoken form, it would be interesting for future research to replicate this type of study in an environment where the non-official language of the classroom is perhaps used more frequently in reading and writing.

Keywords

Classroom discourses
Composite knowledge-language profiles
Functional allocation of languages
High semantic density knowledge profiles
Knowledge profiles
Language-knowledge profiles
Linguistic diversity
Legitimation Code Theory (LCT)
Low Semantic density profiles
Multilingual Classroom Teacher-Talk
Terminology Theory
Translanguaging;
Units of knowledge



Declaration

I declare that *Multilingual teacher talk in secondary school classrooms in Yola, North-East Nigeria: exploring the interface of language and knowledge using Legitimation Code Theory and Terminology Theory* is my own work, that it has not been submitted for any degree or examination in any other university, and that all sources I have used or cited have been duly indicated and recognized by complete references.

Full name: Madu Musa Bassi

Signed: 

Date: 30th September, 2020 _____



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“Acknowledgements are rarely easy to write, not because of narcissism and absence of gratitude, but because so many inevitably do not appear” (Bernstein 2000: ix)

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Dedication

This PhD thesis is decated to my children

Hyelni and Abraham



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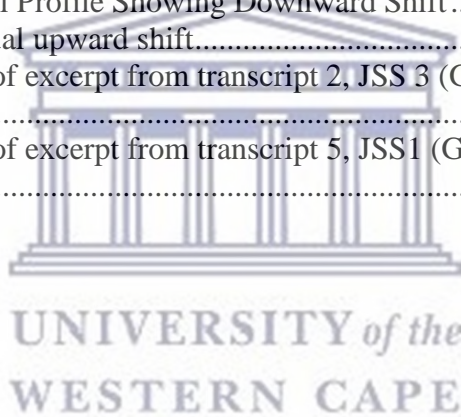
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List of Abbreviations

ALL	Academic language literacy
BEEd	Bachelor of Education
BOH	Bachelor of Oral Health
CFL	Chinese as a foreign language
CS	Code switching
E	English
EAP	English for Academic Purposes
EC	European commission
EFL	English as a foreign language
EL	Embedded language
Eng.	English
ESL	English as a second language
F	Fulfulde
FAL	Functional allocation of languages
GRA	Government reserve area
H	Hausa
H ₂ O	Hydrogen oxide (water)
IRE/F	Initiation, Response and Evaluation/Feedback
ISO	International standard Organisation
JSSCE	Junior Secondary School Certificate of Education
JSS1	Junior secondary school 1
JSS3	Junior secondary school 3
L1	First language
L2	Second language
LCT	Legitimation Code Theory

LoLT	Language of learning and teaching
MA	Master of Arts
ML	Matrix language
MtPC	Mean of term per clause
M.Phil.	Master of philosophy
NPE	National policy on Education
PAR	Participatory action research
PGCE	Postgraduate certificate in Education
PhD	Doctor of Philosophy
SDEng-	Weaker semantic density English
SDHmL1-	Weaker semantic density home language 1
SDHmL2-	Weaker semantic density home language 2
SG+	Stronger semantic gravity
SG-	Weaker semantic gravity
SD+	Stronger semantic density
SD-	Weaker semantic density
SPSS	Statistical package for the social sciences
SS1	Senior secondary school 1
TESOL	Teachers of English to Speakers of Other Languages,
TT	Terminology theory
UWC	University of the Western Cape
WAEC	West African Examination Council
WASSCE	West African Senior School Certificate

CHAPTER 1: INTRODUCTION TO THE STUDY

1 Background of the Study

With an estimated population of well over 195 million (UNDESA, 2018), Nigeria is believed to be the most populous country in Africa, and as having the largest concentration of black persons in the world. Linguistically, the country is situated in what is described as the “fragmentation belt” (Dalby, 1970:1 67); that is, a region around the equator where there is a high cluster and proliferation of languages. Although English is the official language in Nigeria, the country is home to over 400 languages (Owolabi & Dada, 2012: 1676; Danladi, 2013:4; Igboanusi, 2008: 724). Different communities have distinct languages peculiar to them. Simpson and Oyelade (2008: 190) claim that “speakers of almost all languages in Nigeria express clear and strong feelings of loyalty towards their mother tongue”. Unfortunately today, Hausa, Igbo and Yoruba are constitutionally designated as national languages (Jegede, 2011: 42). Conversely, the speakers of those 400 languages or linguistic groups continue to use their languages in their areas and communities (Owolabi & Dada, 2012:677). As Fakuade (2004: 3) has put it, “people do not fling away their languages for no good reason”. For instance, in the eastern region of Nigeria where the Igbo language is dominant, other languages such as Efik, Ibibio, Itsekiri and Ijaw are being promoted by their speakers. In the north, Hausa language is dominant in each of the available linguistic communities, but other languages, for example Fulani, Berom, Nupe, Igala, Egbira, Chamba, Kilba, Bachama, Margi, Bura-Pabir, Tiv, Jaba, Jukum, etc. are basically in use by their speakers. In the southwest where Yoruba is dominant, there are languages like Edo, Urhobo and Isan which are also spoken (Ndimele, 2012: 9). Today, Nigeria is subdivided into six geopolitical zones, namely: South-South, South-East, South-West, North-Central, North-East and North-West. In each of the six zones, many different languages are spoken by people who are divided along linguistic lines (Owolabi & Dada, 2012: 677; Ndimele, 2012: 9).

1.1 Nigeria: A Triglottic Configuration

As far back as 1994, Brann had described the repertoire of Nigerians in terms of a “triglottic configuration” (Brann, 1994:361). Brann argues that many Nigerians would have been exposed to three languages (which he regarded as *mother tongue*, *other tongue* and *further tongue*) by the time they have gone through the first half of secondary education. The mother tongues are referred to as the territorial languages; the other tongue is the language of

the wider community which Brann (1994) referred to as the lingua-franca; and the further tongue refers to the official language, i.e. English. Although Brann referred to three categories of languages, in the actual daily practice of individuals, code switching, or more generally, translanguaging, is frequently the norm. People often draw on features associated with the different languages in their repertoires for meaning making (Bamiro, 2006; Jegede, 2012; Tabaku, 2014; Modupeola, 2013; Ayeomoni, 2006; Amuda, 1994; Nwoye, 1993; Goke-Pariola, 1983; Inuwa, Christopher & Bakrin, 2014).

In Yola, the capital of Adamawa State in North-East Nigeria, where data for the study was drawn, the dominant languages are Hausa and Fulfulde. Individuals are easily seen to draw on Hausa, Fulfulde and English in their everyday or ordinary speech, as the following examples involving Hausa and English show:

- i) *Thank you sir, sai anjima* - Thank you sir, see you later
 - ii) *Mu sake haduwa next week from today* - Let us meet in a week's time
 - iii) *Wasu forcing* dinsu ake - Some (people) are being forced
 - iv) *To yakamata ka dauki casual leave* - You suppose to [you should] take a casual leave
- (Inuwa, Christopher & Bakrin 2014, 165)

1.2 Language Classifications

Considering the four major families into which languages in Africa are classified, namely, Afro-Asiatic, Nile-Saharan, Niger-Congo, and Khosian (Greensberg, 1970; Williamson & Blench, 2000; Bender, 2000; Hayward, 2000; Guldermann & Vossen, 2000), Hausa and Fulfulde, which are of interest to this study, fall within different language families, and are frequently employed in multilingual classroom talk in Yola, North-East Nigeria. Hausa language belongs to the Chadic subgroup of Afro-Asiatic language family and is spoken by over 33,5 million people in Nigeria, where 18 million users are first language speakers (or L1) and 15 million users are second language speakers (or L2) (Ethnologue, 2016). Fulfulde (with varying names for speakers: Fulani, Fula or Fulbe) falls within the Atlantic / senegambian subgroup of the Niger-Congo phylum, and is spoken across the Atlantic Coastline of West Africa (Greenberg, 1970). Fulfulde is spoken by over 52.2 million users within West African countries, with Nigeria accounting for about 15,500,000 users (Ethnologue, 2018, 2017).

1.3 Statement of the Problem

It has been noted by Lin (2013) that studies on multilingual talk, as illustrated by code switching in the classroom, have been repetitive and descriptive, and have for a while not been underpinned by substantially new or different questions (Lin, 2013: 15). First, many of the studies in the literature have, for instance, concluded that there is a functional allocation of languages (FAL) in multilingual classroom teacher talk (e.g. Baker, 2012; Martin, 1996; Probyn, 2006, 2014; Jegede, 2012; Modupeola, 2013; Salami, 2008), such that language ‘a’ is used for presentational knowledge, and language ‘b’ is used for explanatory knowledge, and these claims have not been subjected to sustained scrutiny. Secondly, code switching and translanguaging have increasingly been the dominant and exclusive frameworks used, and this has limited the kinds of insights that can be obtained or the kinds of questions that can be posed. Thirdly, where the effects of multilingual teacher talk on students’ understanding or knowledge are at all captured in studies, such effects have either been based on researcher intuition or have not been the object of sustained empirical demonstration. Fourthly, many studies have assumed merely that it is the configuration of languages that produces claimed effects of multilingual teacher talk, and attention has hardly been paid to repetition of content or to knowledge structure. Fifthly, it is not often the case that studies or findings are presented in a nuanced form that takes into account the possible effect of different subject types, school types or levels of study. Sixthly, and overall, many studies making claims on the effect of teacher’s code-switching or translanguaging on students’ knowledge do not theoretically engage with knowledge, beyond the distinction between presentational and explanatory forms of knowledge, thus illustrating what Maton (2013) regards as “knowledge-blindness” (that is, the paradox of limited engagement with knowledge structures in pedagogical research making knowledge claims). As a result, little is known about how specific units of knowledge are encoded according to categories in a theory of knowledge, how knowledge encodings interface with languages, and how composite knowledge structures-language profiles can be visualised.

1.4 Aim of the Study

The aim of the study is to examine the interface of language and knowledge in multilingual classroom teacher-talk in Yola, North-East Nigeria: using Maton’s (2013) Legitimation Code Theory (LCT) and Terminology Theory (TT) (Antia, 2000).

1.4.1 Objectives of the Study

The objectives are:

- a) to re-examine the claim that there is a functional allocation of language in multilingual teacher-talk (in which language 'x' is used for so-called presentational knowledge and language 'y' for explanatory knowledge);
- b) to describe the encodings of knowledge that occur in a set of science and business studies lessons;
- c) to identify knowledge profiles which are observable in the flow of knowledge in the recorded lessons, and to analyze how language use in multilingual teacher-talk maps onto these profiles – all against the backdrop of given patterns of knowledge dynamics (e.g. semantic waves, semantic flatline both high and low, downward shift and upward shift), emerging from recent research in the sociology of knowledge (Maton, 2013, 2014a, 2014b);
- d) to investigate if there are differences in the composite language-knowledge profiles observed within and across science and business studies lessons, and to explain any such differences;
- e) to analyze the various effects which language-knowledge profiles have on students' understanding of the lesson and on their demonstration of their knowledge.

1.4.2 Research Questions

- a) To what extent is it appropriate to claim that there is a functional allocation of language in multilingual teacher-talk (in which language 'a' is used for so-called presentational knowledge and language 'b' for explanatory knowledge)?
- b) What kinds of encodings of knowledge occur in a set of science and business studies lessons?
- c) What knowledge profiles are observable and how does language use in multilingual teacher-talk map onto these patterns?
- d) Are there differences in the composite language-knowledge profiles observed, and how can they be explained?
- e) What effects do various language-knowledge profiles have on students' understanding of the lesson and on their demonstration of their knowledge?

1.5 Significance of the Study

This study should have the following effects on scholarship and practice:

- a) By interrogating the claims of compartmentalization of language in the classrooms, our study will advance scholarship in the area of multilingualism and multilingual education.
- b) LCT has advanced scholarship in education but in a monolingual context. This study will also be inserting LCT theory in a multilingual context, thus breaking with the monolingual contexts it has thus far been used in.
- c) The effects of language-knowledge profiles on students' understanding of the lesson, which will be demonstrated, should shape the practice and attitudes of students, teachers, and inspectors of education.

1.6 Scope and Limitations

The present research is limited to teacher talk in junior secondary school classrooms in four junior secondary (high) schools in Yola. However, this decision does not suggest that there was no multilingual teacher talk in other schools or on other levels (such as the senior section).

Using text query software, such as SPSS or Atlas-I, would have been useful in analysing classroom teacher talk. However, it was the researcher's view that this would have been prone to errors, as the texts being used are multilingual in nature, and some of the languages (Hausa and Fulfulde) may not be recognized by the machine. We therefore marked up / coded the texts manually, with an inter-rater strategy to minimize errors.

1.7 Chapter Outline

Having presented the overall description of the research context in terms of the background of the study, the discussion and justification of the use of the framing concept of functional allocation of languages in classroom teacher talk, the statement of the problem, the research objectives, and the research questions, the next chapter (Chapter 2) presents the body of literature for this study in the area of multilingual classroom teacher talk: linguistic diversity in the classrooms; the causes of the linguistic diversity in the classrooms; solutions through monolingual discourses in the classrooms; code switching and translanguaging; as well as reviewing studies relating to multilingual language teaching and learning.

Chapter 3 provides the theoretical underpinning of the study: Legitimation Code Theory and Terminology Theory. Using both theories will give us the opportunity to view clearly whether the claims in the literature on compartmentalization are correct.

Chapter 4 describes and justifies the research methodology: the broad research approach, the use of a multiple case study, data collection methods, and the data analysis criteria and processes. A brief outline of the research process is also provided, with a discussion of the related ethical considerations of the study. This chapter also presents brief descriptions of the selected schools with their linguistic spaces.

Chapter 5 presents two findings. The first part presents a total overview of the terms and clauses generated in the content of the lessons, and presents the analysis of the core content of the research on the functional allocation of languages in multilingual classroom teacher talk. The second part of the chapter discusses the encodings of knowledge in both science and business studies lessons that are obtainable in the data.

Chapter 6 unlocks the knowledge patterns in the lessons. To be able to do that, the chapter presents three findings. The first finding of the chapter seeks to identify the different kinds of knowledge profiles that are observable in the lessons; the second finding examines and explains how language use in multilingual teacher talk is superimposed/ mapped on the profiles. The third finding deals with the differences in the composite language-knowledge profiles associated with science and business studies lessons.

Chapter 7 presents a discussion of the research findings in relation to the students' understanding of the lesson and of their demonstration of their knowledge. The students' tasks that followed the lesson presentations as corrected by the various teachers who taught the lessons are analyzed and discussed.

In the concluding Chapter 8, we first recall the reason (problem) of the study, the objectives, and the research design. We then present a summary of the major findings, and the contributions of the study towards knowledge. The chapter concludes with suggestions for future research.

CHAPTER 2: LITERATURE REVIEW

2 Background: Nigeria's System of Education

Before focusing on the literature, let us first provide a brief account of the Nigerian education system. The National Policy on Education (2013, henceforth NPE) specifies that in initial schooling (that is, primary one to three), the language that should be used as medium of instruction is the language of the immediate community in which the school is located (NPE, 2013:8), and English is to be taught as a subject (NPE, 2013). However, where such a language is not “viable” then “the language of the wider community should be used” or adopted as a medium of instruction (NPE, 2013:8). Beyond the first three years of schooling, the National Policy on Education emphasizes that English should be used as medium of instruction.

It is pertinent to note that the Nigerian education system is divided into three tiers (NPE, 2013:3). The first tier is the primary education level which spans six years (primary 1-6). The qualification issued after primary education in Nigeria is the First School Certificate which is the entry requirement into junior secondary education after a Common Entrance Examination. The second tier of education is the secondary education (high school) and it is divided into two levels: the junior (high) secondary school with a duration of three years, beginning from JSS1 (Grade 7) to JSS3 (Grade 9), and the qualification obtained is The Junior Secondary School Certificate of Education (JSSCE), with which the candidate proceeds to the next level of secondary education. The second level of secondary education is the senior (high) secondary school which starts with SS1 (Grade 10) until SS3 (Grade 12). The final qualification for attaining this level of education is the West African Senior School Certificate (WASSCE), the Matric. The WASSCE certificate is the minimum entry qualification into tertiary institutions. The third tier of education in Nigeria is the tertiary education which consists of the universities, polytechnics and colleges of education with various durations and types of courses offered.

With respect to the secondary school education, which is our focus, the official language for medium of instruction for content subjects (eg, physics, chemistry, biology, geography) is English irrespective of the regions where the school is situated or established. For language subjects like Hausa, Yoruba, Igbo, Arabic and French, the medium of instruction combines both English and the language.

2.1 Proficiency in English

In Nigeria, proficiency in the language (English) that is the medium of instruction beyond the first three years of schooling is generally low. It is estimated that “only about 30% of Nigeria’s population is effectively or functionally literate in English” (Buba, 2016: 93). English is often a second, third or even fourth language for many Nigerians. As a result of Nigeria’s multilingual nature on the one hand (Ogunmodimu, 2015: 154), and the monolingual language of the education policy on the other hand, there have been concerns regarding the issues of language in many tiers of the education system, especially on learners’ proficiency and participation in secondary school (Oluwole, 2008; Yakeem, 2015; Ogundele, Olanipekun & Aina, 2014; Adekola, Shoaga & Lawal, 2015). For instance, Adekola, Shoaga and Lawal (2015) attempted to determine students’ performance in the English language in secondary schools as a yardstick for academic achievements in other general subjects in Ogun state, Nigeria. The targets were SS2 students who were randomly selected using questionnaires and an achievement test in English, Mathematics, Economics and Biology. The results revealed the achievement of students in general subjects could be greatly influenced by the level of their performance in the English language. Likewise, Ogundele, Olanipekun and Aina (2014) traced the causes of poor performance in the West African School Certificate in Nigeria and reported that proficiency in English is a major factor of academic performance. They revealed that, firstly, the teachers have a poor understanding of the pedagogical content knowledge to teach, and secondly, students lack the reading spirit to prepare them for the examination. In a corresponding survey, Yakeem (2015), assessed the performance of students in oral English, in Kwara State, Nigeria. He adopted a descriptive study of 300 students who were randomly selected from three senatorial districts representing 100 students from each district. Yakeem (2015:19) found that the “performance of students in English is poor due to poor grammatical foundation of the students right from the primary school (as well as their) performance in test of oral English is low”. Supporting these assertions, Oluwole (2008) examined the effect of the mother tongue on students’ achievement in the English language in the Junior Secondary School Certificate Examination (JSCE), the end of junior high school examinations which prepared students for senior high school. His study targeted students who had already written the JSCE examination from five schools in the Abeokuta and Ijebu zones of Ogun State, Nigeria. Oluwole (2008) revealed that the majority of students considered the English language a difficult subject because of their inability to comprehend every part of the language.

Considering the poor performance of students in various school subjects, Fakeye (2009: 491) says “scholars blame it on the students’ weakness in English language proficiency”. With a similar aim of examining the relationships between English proficiency and academic achievement among graduates of senior secondary school in Nigeria, Ozowuba (2018) found that many students who have completed secondary school education lack competencies in English.

Various reports from the West African Examination Council (WAEC), the examination body responsible for Nigeria’s end of secondary year examinations, indicate a drastic decline in students’ performance in English and other content subjects, but a slight improvement in Igbo, Hausa and Edo languages (WAEC report, 2015). In a progress report presented to the National Education Committee, the chief examiner’s report indicated that the performance of learners in examination varies from one subject to the next. The areas of concern for the candidate include poor grammatical competence, spelling errors, and difficulty in framing responses due to a poor command of the English language. This could be traced back to the problem of the monolingual language policy of instruction (Aina *et al.*, 2013a:670). Stakeholders have continued to advocate multilingual teaching and learning in the Nigerian secondary education system using the learners’ main languages.

2.2 English for Academic Purposes

There is a lot of research that has been done on language for academic purposes and specifically English. Linguistically oriented studies have focused on the importance of nouns/nominalisations in academic language, terminology, the use of the passive voice and third person pronouns, the absence of emotive language, and so on (Sager, Dungworth & McDonald, 1980; Halliday & Martin, 2003; Gotti, 2003). In many of these studies, the importance of terminology is underscored. For example, Sager, Dungworth and McDonald (1980: 230) claim that “the lexicon of special languages is their most obvious distinguishing characteristic”.

Genre-related studies of English for academic purposes have focused on the schematic structures of academic articles (Swales, 1990 & 2004), the structure of argumentation, as well as stance-taking (Kockelman, 2004; Chang, 2010; Lancaster, 2016), and so on. Until recently, however, much of the work has been on written English. This is especially unfortunate, given the widespread use of English in academic settings, both in traditional and non-traditional

English-speaking contexts. According to Flowerdew (1994), English is now well established as the language of international academic exchange. It is being utilised as a second language by students studying overseas in English-speaking countries. It is also being used by students in countries with a history of British colonialism, for instance, English is a second language in Nigeria, South Africa, Malaysia, Ghana, Zimbabwe, and other former British colonies. English is being used as language of instruction (e.g. in Japan and Germany) where there is no requirement for the language, but the language is being endorsed as part of the globalization of academic studies.

Long and Richards (1994: ix) observed that the “nature of listening comprehension has received relatively little attention compared to the large range research that has been directed at the nature of written and spoken discourse and second language reading comprehension”. As a result of this focus on written language, there has been limited research on academic speaking, academic listening, the strategies students (especially non-home users of English) use in understanding the detailed structure of academic lectures, and so on. Although academic writing and academic speaking are not totally dissimilar, it is well known that writing undergoes processes of editing and revision. Writing tends to be more normative. In writing, a term that is used may be changed by an editor/reviser because it is not the standard term even though it is contextually meaningful or understandable (at least for some readers). In speaking, such revision may not take place. Biber, Conrad, Reppen, Byrd, Helt, Clark and Urzua (2004) also have pointed out the absence of studies on the features of spoken academic English, a situation which makes it difficult to prepare students who are non-home users of English for lectures delivered in this language. The shortcoming of studies on English for Academic Purposes (EAP), from the standpoint of this thesis, is that many of them are conducted in English; there have been no interest in multilingual classroom teacher-talk.

2.3 Linguistic Diversity in the Classrooms

There have been many studies recently that have pointed to just how linguistically diverse secondary school classrooms are across the world – Ncoko, Osman and Cockcroft (2000), Setati (1998), Probyn (2006) in South Africa; Garcia (2009), Parikh (2016) in the US; Nyaga and Anthonissen (2012) in Kenya; Nordina, Ali, Zubir and Sadjirin (2013) in Malaysia; Gogolin (2002), Wiese *et al.*, (2017) in Germany; and Hobbs, Matsuo and Payne (2010) in the UK. All of these studies are helping to uncover linguistic diversity in the classrooms. In Nigeria, there are studies by Igboanusi (2008), Jegede (2012), Salami (2008), and Igboanusi

and Peter (2016) on how classrooms are becoming more diverse. Salami (2008) in Ile-Ife, Southern Nigeria, where Yoruba is spoken by the majority of the people, explores the level of language practices in Nigerian primary school classrooms (primary 1–6) against the backdrop of the policy of mother tongue education. Salami (2008: 98) visited three schools and noticed that in these classrooms “five languages, Yoruba, Hausa, Igbo, Edo and Urhobo” are represented in the classrooms. In South Africa, Setati (1998) investigated the different ways in which a multilingual mathematics teacher uses multiple languages when teaching in a second language. The study was conducted in a farm school west of Johannesburg. Setati revealed that, in a Grade 5 class where there were 33 learners who were all second language speakers of English, two other languages, Tswana and Afrikaans, were also represented in the class. Ncoko, Osman and Cockcroft (2000) corroborated Setati (1998)’s findings in a study of two primary schools in Johannesburg, Gauteng Province, in South Africa. They used 40 multilingual students who were randomly selected. The language of learning and teaching is English, isiZulu and Afrikaans are taught as subjects. Incidentally, speakers of the nine other official languages of South Africa were all represented in the class. In Germany, Gogolin (2002) reported on a small primary school in the inner city of Hamburg with a population of no less than 200 children. She revealed that more than half of the children were monolingual speakers of German, whereas the other 50% came from 15 nationalities comprising of about 20 different home languages. Nyaga and Anthonissen (2012) in Kenya researched the difficulties of implementing the language policy in education in linguistically diverse Kenyan school classrooms. They focused on the teachers’ management of linguistic heterogeneity of the learners in the classrooms. Kenya is estimated to have about 60 languages spoken alongside the two languages that are adopted as the common languages of communication: English and Kiswahili. Visiting four multilingual schools (urban, peri-urban, rural 1 and rural 2), for instance, the classroom that Nyaga and Anthonissen (2012) selected in the peri-urban school comprised of 32 learners. From the 60 indigenous languages spoken in Kenya, 11 languages were represented in the class. They further reported that in the semi-urban school, 28 learners were selected with six indigenous languages were represented in the class. While in the rural school 1, learners were drawn from three languages common in the area viz: Kikamba, Kitharaka, and Kimbeere. While in the rural 2 school, 44 learners were selected in the target class representing three indigenous Kenyan languages: Kikuyu, Kitharake, and Kimenti. Likewise in the US, Parikh (2016) worked with students who had different first languages in the classroom. In the emergent bilingual English language learners’ class, the native speakers of Vietnamese, Korean, Cantonese, and Spanish were represented. As the

language of instruction in her class was English, Alisha Parikh reported that the various first languages of the students were integrated into the classroom activities. Parikh observed that the incorporation of these languages in the classroom interaction validated the children's linguistic and cultural backgrounds. In Brunei, Darussalam, Martin (1999: 38) examined the "bilingual unpacking of monolingual texts in two primary classrooms" and disclosed that in both classroom A and classroom B learners of Malay, Tulong and Iban, Dusun, and Brunei Malay speakers were represented.

What is interesting about this is that this diversity is not just taking place in countries that are known to be multilingual in nature, such as Nigeria with over 400 languages, South Africa with 11 official languages, India 447 languages and Indonesia with 707 living languages (Ethnologue, 2017), and Kenya with over 60 languages (Nyaga and Anthonissen 2012). We also find this phenomenon of linguistic diversity in countries that are usually thought of as being mainly monolingual, like Germany (Gogolin, 2002), the US (Garcia, 2009; Parikh, 2016) and Britain (Creese & Blackledge, 2010).

2.4 Motivations for Diversity in the Classrooms

A number of reasons have been adduced for the increasing diversity which we find in the classrooms. For instance, migration (internal or transnational) is a key factor, especially in urban areas which are attracting people from different parts of the world (Garcia, 2010; Garcia & Kano, 2014, 2015, Wei, 2014, de Kleine & Lawton, 2015 in USA; Creese & Blackledge, 2010 in UK; Heller, 2007 in Sweden; Makalela, 2015 & 2016 in South Africa; Christopher, 2014 in Nigeria). In the growing call for globalization, the European Commission (2015:9) observes "growing levels of mobility" as a main reason for the linguistically diverse classrooms. Many scholars are of the view that mobility, which is the movement of people either nationally (within a country) or internationally (and intercontinentally), is the major factor (de Kleine & Lawton 2015; Christopher 2014). Due to globalization, what has happened in places that were in the past regarded as monolingual and mono-cultural are now a lot more diverse (Wiese *et al.* 2017; Hornberger, 2002). Garcia (2009:147) reveals that "globalization brought increasing linguistic complexity with the movement of people, information, services and goods and people who accompanied it".

Other studies have pointed to the causes of the mobility of people to include new patterns of social relations such as family (inter-marriages) which leads to situations where the

children of a family will speak one language to the parents at home and another language in schools (Hornberger, 2012; Canagarajah, 2011; European Commission, 2015). For instance, in a survey by the European Commission in 2015 on migration to uncover the language use of migrant children, reports that “migrant children use a language at home different to the language of school instruction” (European Commission, 2015:9).

The third reason for the linguistic diversity in the classroom is labour arising from “the expansion of capitalism and transnational labor migration” (Hornberger, 2002:31), which has become a major factor that brings about linguistic and cultural diversity in the classrooms. People are now moving with their entire family from one part of the world to the other in search of work. Another reason for this mobility may be as a result of war (civil, insurgency / terrorist attacks) or natural disasters such flood, earthquake and fire by which people with different languages and culture can be moved into the same internally displaced persons camps.

2.5 Consequences of Linguistic Diversity in the Classrooms

In many of the environments we are talking about here, there is an official language policy which is usually a monolingual language policy. Because most learners are not familiar with the official language of the classroom, there is therefore the question of language choice for teaching. In other words, one of the obvious challenges that this linguistic diversity imposes on teaching is how teachers or instructors need to respond. Learners who do not understand the medium of instruction (which is often a foreign language), their ability to learn in such an environment is going to be impeded (de Beer, van der Walt and Mabule, 2001; Adamo and Igene, 2015). In a survey of language practices of biology teachers in secondary schools in Cape town, de Beer, van der Walt and Mabule (2001:117) reported that 60% of the teachers showed “that the learners experience a problem with English”, the official classroom language. In other words, there is the problem of comprehension of the lesson arising from the difficulty in understanding the official classroom language. Looking at the challenges of teaching in multilingual classes, Adamo and Igene (2015) in Nigeria observed that pupils who speak different languages are brought into the classroom with different linguistic competences. Unfortunately, teachers do not have the capacities to harness the differences which keep some learners at a disadvantage. As the classrooms become more and more diverse, and as a result of the mobility of learners, the European Union in 2015 undertook an assessment of classrooms where migrant learners attended in order to ascertain the learning

challenges and discovered that “migrant children without the language of instruction do not reach their potential, are more likely to leave school early and have lower levels of attainment throughout their schooling” (EU, 2015: 9). These young learners struggle to “engage with a culturally and linguistically exclusive curriculum and be seen as valuable contributors to the school community” (French, 2016: 299). This could be as a result of the types of education policies adopted in most Western countries. The education policies of most European countries emphasize “language use and proficiency in the dominant language as a condition for academic success” (Pulinx & Van Avermaet, 2014: 9). This monolingual policy is not only obtainable in Europe, but even in multilingual spaces like Africa and Asia. Since the language of teaching and learning, or the medium of instruction, influences learning, Songxaba, Coetzer and Molepo (2017: 7) in South Africa report that the “monolingual teaching does not yield positive result in that learners struggle to understand the lesson”. Songxaba *et al.* were referring to the official classroom language being used, having realized that putting learners who come from different language backgrounds in one classroom, and who happened to be taught in one language, will definitely face challenges of comprehension. In other words, there will be “several negative consequences for learners’ processing mechanisms” (Lee, 2012: 144). It could also lead to “a higher failure and drop out ratio for some learners than for the others” (Mokgwathi *et al.*, 2013: 108). Apparently, there could be greater inequality, or even when all pupils passed, the quality of knowledge may not be of good standard. As Gogolin (2002: 123) puts it, there is the “prevention from equal access to knowledge”. This means that the classroom is no longer an equitable and socially just environment, because some learners are advantaged over others in terms of learning.

2.6 Solutions to linguistic diversity in the classroom

Faced with the challenges of multilingual learners’ failure to comprehend teaching and learning in monolingual language policy environments, scholars and policy makers at various times have come up with different models and solution paths.

2.6.1 Monolingual Classroom Discourse

Given this linguistic diversity, it is interesting to note that studies of classroom discourse have for a very long time been mainly interested in creating a sequence and dealt with only monolingual spaces. For our context here, the idea is that accounts or models of classroom discourses are intended to show how, ultimately, students of varying linguistic backgrounds

can be assisted even within a monolingual background to follow lessons. Thus, some of the earliest studies of classroom discourse by Sinclair and Coulthard (1975) were interested in such issues as in the sequence of interaction, for instance, modelling the interaction that takes place in the classroom in the form of a schemer. They came up with IRE/F schemer where **I** stands for Initiation usually by the teacher, **R** means Response by the students, and **E** evaluation, or **F** feedback by the teacher. However, Sinclair and Coulthard's (1975) model is all taking place in a monolingual environment. We did not notice for instance, Initiation in one language and the response in a different language or evaluation in another language.

Similarly, there has been quite a lot of work on the types of classroom discourse with Christie (1997) positing regulatory registers and instructional registers. Regulatory registers means discourses in which the activity or event of the classroom is organized, while instructional registers refers to the language which transmits the actual contents of the lesson. Christie distinguishes between three circles for the development of a curriculum macrogenre. The first circle is the curriculum initiation in which the teacher uses the regulatory discourses in the class to orient the learner on what to expect during the lesson. The second circle is the curriculum negotiation which involves the instructional discourses where both the teacher and the learners collaborate by writing and making notes. The third circle is what Christie refers to as curriculum closure and comprises both regulative discourses and instructional discourses; students prepare sample texts to discuss with their classmates. In providing this account, Christie does not seem to have any engagement with linguistic diversity as such.

Equally, Lemke (1990) provides a much longer list of classroom discourses (seven) and found that triadic dialogue is the most common activity structure of classroom lesson practices. It involves teachers asking questions, inviting students to answer them, and evaluating the answers. Lemke (1990:29) argues that in triadic dialogue "a Question is often thematically incomplete without its Answer, and in triadic dialogue it needs the Evaluation of the Answer as well". This model is similar to the IRE/F model in Sinclair and Coulthard's submission. Unfortunately, Lemke's position does not seem to make any reference to linguistic diversity.

Similarly, Nystrand and Gamoran (1990, 1991) provided types of classroom discourse which teachers and learners operate in while in the classroom. They came up with the procedural engagement and instructional engagement. They refer to procedural engagement as discourses that the teacher and students engage in for the arrangement of classroom rules and regulation, whereas the instructional engagement involves discourses on content and

academic work. Again, Nystrand and Gamoran's (1990, 1991) construct is not different from Christie's (1997) regulative discourses and instructional discourses, and does not envisage the issue of linguistic diversity.

2.6.2 Models of Bi/Multilingual Education

Models of bi/multilingual education have been widely proposed to respond to concerns of linguistic diversity. Baker (2006) proposes ten types of models to address this situation. Some of the models include “submersion (with structured immersion), transitional model, segregationist model, immersion”. One of the criticisms we need to make about Baker's typology is that these models are basically western models. For instance, the submersion model with a “structured immersion” has the aim of assimilating the learners into both western culture and language with the aim of making them monolinguals, at the end of which the learners lose their home languages. In the submersion model involving ‘withdrawal classes’, there is what is referred to as ‘pull out classes’ (Baker 2006:182), where the minority learners are taken out of the English-majority main classroom (Baker, 2006; Garcia, Kleifgen & Kalchi, 2008; EU, 2015). In a survey of ESL classrooms in the United States, Garcia, Kleifgen and Kalchi (2008:32) claim that with the “pull-out approach students are taken out of their regular classrooms (usually daily for one to two periods of instruction) and given one-on-one or small group instruction”. This model proposes that “children without the language of instruction should be quickly moved to having targeted and continued language support provided in mainstream classrooms (immersion) rather than in separate classes” (EU, 2015:10), and that teachers should try to simplify the English for them. The aim is still to create monolingual learners.

In Baker's (2006) transitional model, (for the minority child) the language of the classroom may be English in the beginning, but the teacher will occasionally use a little bit of the learners' language and go back to employing English. The model will further translate in assimilating the child into monolingual English. As for the segregationist model, the bilingual child has no choice but to learn through the majority language, which Baker (2006:195) refers to as the ‘apartheid’ type of model. The immersion model, ironically, is viewed as the strongest bilingual model where both languages are used in the classroom with the initial emphasis on the second language. The child in this model speaks the majority language which is the medium of instruction. However, this method will only cause the learners to become monolingual. As Pulinx and van Avermaet (2014:10) put it: “these monolingual

education policies, as currently implemented in different Western European countries, are based on monolingual ideologies”. There is the need for flexible approaches to bi/multilingual content instruction in order to “break away from the immersion model” (Lin, Wong & McBride-Chang 2012: 7). Moreover, Baker (2002) admits that “immersing children in an English school or replacing their first language with English has never worked anywhere in helping children to perform” (in Magkato, 2014:935).

Unfortunately, Western-based models which have been implemented in Africa and other Third World countries have had disastrous consequences and have impeded educational development in these countries. Given the particular nature of Nigerian heterogenetic types of environment and Africa in general, Baker’s models of bilingual teaching do not provide the child with the necessary language proficiency for learning.

2.6.3 Code Switching

Another response has been code switching in teaching and learning, where two or more separate languages are used in the class (Estape, 2018; Mokgwathi, 2011; Martin-Jones & Saxena, 2003). Code switching has to do with language alternation and often relies on the different types of discourses (Gulzar, Farooq & Umer, 2013; Martin-Jones, 2003).

As far back as early the 1980s, code switching in daily interactions, as well as its practice in the classroom, has been studied (Myers-Scotton, 1983, 1988, 1993, 1995). Code switching is “the use of two or more linguistic varieties in the same conversation” which could both be “intrasentential or intersentential” (Myers-Scotton, 1988:132). In analysing code switching, Myers-Scotton (1993: 11) developed a theory she termed “the markedness language frame (MFL)” to account for the descriptive analysis of language. From the MFL model, Myers-Scotton (1993) then identifies the matrix language (ML) and the embedded language (EL). The matrix language refers to the main language involved in code switching dialogues which plays the dominant role in the interactions. The embedded language (EL) is the other language which is also involved in code switching but with a lesser role. In her early publications, Myers-Scotton (1988) distinguished between code switching and borrowing and suggested that “borrowed morphemes are more assimilated phonologically in L1 than switched morphemes” (Myers-Scotton, 1988:133). In addressing the classroom code switching, she revealed the matrix language is the official language of instruction while the embedded language is the mother tongue or main language of the learner.

Auer (1998) provided the distinction between what he termed “discourse-related and participant-related code switching”. By discourse-related code switching he refers to as speaker-oriented, working as a strategy for signalling an interactional meaning during bilingual discourse, which may be connected to a particular participant, topic or phase of the discourse, while participant-related code switching addresses language preference in the arrangement of conversation.

Gumperz and Bloom (2000: 126) identify two types of code switching: “situational code switching and metaphorical code switching”. By “situational code switching” they mean switching from a more prestigious language (e.g. English) to a less prestigious one (eg. isiXhosa); whereas “metaphoric code switching” is an affective kind of switch for expressing “identity and/or solidarity” (Gumperz & Bloom, 2000: 126).

Code switching in the educational system has given birth to a body of literature focused on pedagogical code switching in the classrooms. In the classroom, teachers use code switching as “a strategy to compensate the deficiency on the part of students” (Gulzar, Farooq & Umer 2013: 6). The use of code switching in the classrooms assists the learners to appreciate new contents and concepts as well as improve their language proficiency (Setati, Adler, Reed & Bapoo, 2002). As Martin-Jones and Saxena (2003:6) explain, “Bilingual teachers and learners routinely use code-switching as an additional meaning-making resource within the ongoing flow of classroom talk”. In other words, to be able to create a meaningful environment for learning, bilingual teachers use code switching to scaffold meaning during teaching and learning. Moreover, code switching “increases learner participation and lesson comprehension” (Mokgwathi & Webb, 2013:108).

To achieve a desired meaning-making talk, Van der Walt, Mabule and De Beer (2001:170) suggest what they refer to as “responsible code switching”. By responsible code switching they mean the ability of the teacher to “identify strategies and times for code switching that will be to the advantage of the students” since the academic “performance of students is inevitably influenced by their competence in the language of learning and teaching” (Van der Walt, Mabule & De Beer, 2001:170). Rios and Campos (2013, 387) argue that “classroom code-switching (...) provides a natural short-cut to content and knowledge acquisition”. Whether a teacher-led code switching or student-led code switching, the model serves pedagogical purposes.

2.6.4 Translanguaging

Another response to linguistic diversity in the classrooms is translanguaging (in South Africa, Makelela, 2015; Probyn, 2015; in US, Garcia, 2009; Hormberger & Link, 2012; in Wales, Lewis, Jones & Baker, 2012; in UK, Creese & Blackledge, 2010; in Sri Lanka, Canagarajah, 2011; and in Sweden, Lytra & Jorgensen 2008; Heller, 2007). Lewis, Jones and Baker (2012: 643) traced the origins of translanguaging in education and reported that the model ‘translanguaging’ was first created by Cen Williams in Wales in 1994 as a “planned and systematic use of two languages for teaching and learning inside the same lesson”. It is a pedagogical practice by which the teacher intentionally alternates “the language mode of input and output” Lewis *et al.* (2012:643) in bilingual classrooms. From the Welsh perspective, Lewis *et al.* (2012:643) reiterated that in the “translanguaging model you receive information through the medium of one language (e.g., English) and use it ...*in the* medium of the other language (e.g., Welsh)”. In other words, for listening the students use English, while for writing the students use Welsh (Williams, 1994, in Welsh).

However, this model is no longer being theorized as language alternation, but is centred on a cohesive model of language which shows that when people are speaking or writing, they are drawing on features which society would assign to specific languages (Otheguy, García & Reid, 2019). For instance, a language is called Hausa, another is called Arabic, but the speaker is drawing from just one container of languages. Unlike code switching where languages are kept apart (Gwee & Saravana, 2018; Narayan, 2019; Rathert, 2012), translanguaging is a “process by which students and teachers engage in complex discursive practices that include all the language practices of students in order to develop new language practice” (Garcia, 2014:3). Childs (2016:22) views translanguaging as a means of providing “planned and systematic use of the home language of learners with the language of the classroom in order to foster learning and teaching.” It is the process of “making meaning, shaping experiences, gaining understanding and knowledge through the use of two languages” (Baker, 2011:288). Thus, both languages are used in a “dynamic and functionally integrated manner to organise and mediate mental processes in understanding, speaking, literacy, and, not least, learning” (Lewis, Jones & Baker, 2012:641). Translanguaging is a valuable concept when discussing language use in the classroom as its main focus is on the students’ or teachers’ complete deployment of their linguistic repertoires (Turner, 2017). Duarte (2018) distinguishes between natural translanguaging and official translanguaging. He argues that natural translanguaging happens freely in “classroom interaction in order to

enhance subject or language-related understanding”, whereas official translanguaging refers to “explicit strategies employed by teachers in order to use several languages in class” (Duarte 2018:13). That is to say, natural translanguaging occurs unconsciously and automatically in the process of teaching while the official translanguaging is a planned activity / alternation. Rasman (2018: 690) sees translanguaging as “scaffolding, using L1 to help learners study L2”. This means the ability to use different languages to make meaning. For Antia (2017a: 8) translanguaging is the enhancement of “communicative potential through a process of making meaning across language boundaries”. Studies have shown that “students are more likely to experience academic success when they are allowed to translanguage both in English-medium schools” and the home languages (Collins, Sánchez & España 2019: 3).

In justifying the translanguaging approach, researchers in the field claim that code switching does not address the problem of learners’ comprehension in the classroom (Creese & Blackledge, 2015; Garcia, 2009; Garcia & Wei, 2014). Creese and Blackledge (2015:26) assert that a “translanguaging approach to teaching and learning is not about code switching but rather about an arrangement that normalizes bilingualism without diglossic functional separation”. This means that translanguaging is all about the deployment of the available resources in the learners’ repertoire to maximize teaching and learning.

2.7 Use of more than one language in multilingual teacher talk

Multilingual teacher-talk has not been limited to one subject. It has been discussed in Arts, Science and Humanities. Studies in different continents have demonstrated that in multilingual classrooms teachers teach multilingually. In the context of Africa, Krause and Prinsloo (2016) discussed teacher views on the use of more than one language, and noticed isiXhosa and English are used in the teaching of mathematics in Grade 5, in Khaleshiya Western cape, South Africa; Probyn (2015, 2009, 2005) reported isiXhosa and English are used in the teaching of science, while Arabic and English are used in the teaching of EFL (Adriosh and Razi 2019); Afrikaans and English are used in English language learning lessons (Van der Walt 2009). Similarly, Setati (2005) recounted teacher views on the use of more than one language and revealed that Setswana and English are used in the teaching of mathematics. Setati, Adler, Reed and Bapoo (2002) reported in multilingual teacher-talk that Northern Sotho, Tsonga and English are used in the teaching of Mathematics, Science and English. Likewise, Tswana and English are used in the teaching of mathematics Setati (1998).

English and Swahili are used in the teaching of Political Science and Public Administration (PSPA), and Sociology and Social Anthropology (SSA) at University of Dar es Salaam University, Tanzania (Shartiely 2016). From Botswana, Setswana and English are used in the teaching of four subjects: English Language/Literature, history, home economics and biology (Mokgwathi and Webb 2013), while, from Ghana, Ewe (L1) and English (L2) are used in the teaching of English and social studies. Ndayipfukamiye (1996) reported in Burundi on teacher multilingual talk that Kirundi and French are used in the teaching of French. From Nigeria, Jegede (2012) discussed how Yoruba and English are used in the teaching of mathematics in multilingual public primary schools in Ile-Ife, South-West, as when Yoruba, Hausa and English are used in the teaching of English, mathematics and social studies (Salami 2008).

From the US, Gort and Pontier (2013) discussed multilingual teaching in two dual language preschool classrooms where Spanish and English are used in English lessons. Similarly, Spanish and English are used in the teaching of Literacy. Martin-Beltrán (2010) has also discussed the affordances for bilingual language learning from which Spanish and English are used for English language learning in a fifth-grade classroom. In a similar study, Garcia and Bartlett (2007) described multilingual teacher talk in a classroom scenario and put forward that Spanish and English are used in the teaching of English as second a language (ESL). Also, Seidlitz (2003) researched patterns of language alternation and reported that English and German are used in the teaching of German as a foreign language at the University of Texas at Austin. It is also reported by García-Mateus and Palmer (2017) that Spanish and English are employed in the teaching of science and social studies

From Europe, Edvinsson (2015) and Johansson (2013) both examined the multilingual teacher talk in upper secondary classrooms in Sweden and revealed that Swedish and English are deployed by teachers in English as a second language (ESL) lessons. In the UK, we find out that Japanese and English are blended in the teaching of Japanese language (Creese and Blackledge 2010). Camilleri (1996) discussed multilingual talk in secondary school classrooms in Malta and revealed that Maltese and English are used in the teaching of mathematics, home economics, biology, economics and integrated science lessons, whereas Estonian and Russian are employed in the teaching of Russian philology and Russian as a Foreign Language (Zabrodskaja 2008). In Israel, Shay (2015) revealed that in teacher talk in multilingual classrooms in Tel Aviv, Hebrew, English and Arabic are used in the teaching of English as a foreign language

From Asia, Bhatti, Shamsudin and Said (2018) in Pakistan explored teacher multilingual talk and noticed Urdu and English are employed in the teaching of English as foreign language; as Bangla and English are used in English language teaching in Bangladesh (Chowdhury 2013). Grant and Nguyen (2017) examined multilingual teacher talk in English as a foreign language lesson in a certain university and reported that Vietnamese and English languages are used by the teacher. When Cahyani, de Courcy and Barnett (2017) examined multilingual teacher talk in an Indonesian State Polytechnics, they discovered that Bahasa Indonesia and English are used in the teaching of Accountancy and Business Administration. Similarly, study in Brunei indicated that English, Bahasa Melayu and Brunei Malay are employed during teaching of content lessons of History, Science, Mathematics and Geography (Martin 1996). Although Faarsi and English are blended in the teaching of English as a foreign language in Iran (Rezvani and Rasekh 2011), Arabic and English are utilised in the teaching of English as a foreign language in Jordan (Hussein (2013). Likewise, Mokhtar (2015) studied multilingual teacher talk in Malaysian university and revealed that Malay and English are employed in the teaching of Civil Engineering. Equally, Mandarin and English are used in the teaching of English as foreign language in Taiwan (Tien 2009). While Lin (2006) discussed multilingual teacher talk in Hong Kong and noticed English and Cantonese are used in the teaching of science, Diana-Lee Simon (2001) reported that Thai and French are used in the teaching of French as a foreign language. Liu, Lo and Lin (2020) revealed that Mandarin Chinese and English are used in the teaching of English for Academic Purposes in Public Health at a university in Southern China.

2.8 Effects of multilingual talk on learners' understanding

In code switching or translanguaging literature, there have been research claims regarding students understanding lessons better when the non-official classroom language was incorporated into multilingual classroom teacher talk (Allard 2017; Probyn 2015; Poza 2018; Licona and Kelly 2020; Karlson, Larsson & Jakobsson 2019; Mckinney and Tyler 2019; Allard 2017). Empirical evidence for these claims is however not always provided systematically, but is based on the researchers' intuition. For instance, in the study by Allard (2017), we are told that the non-official classroom language was used to make the students understand better. But the study does not give any written task that specifically investigates the students' understanding, rather it gives us quotations/ extracts from the students talk around the topic. Probyn (2015: 232) says that the use of the non-official classroom language "contributed to a better (students) understanding of the science content than if teachers had

not used isiXhosa at all” but the data used to support this claim is excerpts of teacher-talk. Similarly, Poza (2018) reports that the use of the non-official classroom language in multilingual classroom makes the students understand the lesson better. Again, the evidence provided by Poza has to do with students’ discussion around science text and there is no formal assessment to prove the assertion. Equally, Licona and Kelly (2020) inform us that the non-official classroom language was used to support students learn better. Unfortunately, the materials provided as the basis for the claim are excerpts from teachers’ multilingual talk in the classroom. There was no formal assessment of the students to interpret if they really understand the content better. Karlson, Larsson & Jakobsson (2019: np) reveal that the use of non-official classroom language “improves the probability that students’ understanding of the subject will increase”. But what is presented as empirical evidences are conversational sequences that students engaged using the non-official classroom language. Mckinney and Tyler (2019) also point to the idea that the use of students’ home language in multilingual classroom teacher talk improves the students understanding of the lesson. But then the data used to underpin this claim is a science text presented to two students to translate and discuss the content in the non-official language; there is no specific task to support the claim of learning outcome.

Correspondingly, García-Mateus and Palmer (2017) agreed that multilingual talk in the classroom assists the students understand the lesson better. Unfortunately, the study did not provide any written tasks that examine the students understanding rather what we observed are language exchange between the teacher and the students. Even with the exchange, we could not spot any informal or systematical assessment. Similarly, Hansen-Thomas, Stewart, Flint and Dollar (2020) report a positive impact on students understanding when the non-official classroom language was used in teaching. Regrettably, the study does not provide any task to show as evidence that students really understand the content well. It rather furnishes us with teachers’ views or perceptions on the use of the learners’ home language in the classroom. Hornberger and Link (2012:269) say teachers’ use of the learners home language is to “build on students’ communicative repertoires to facilitate successful school experiences and greater academic achievement”. But, the data Hornberger and Link provided does not support the claim of students understanding of the lesson better.

We also understand from Deroo and Ponzio (2019:214) that translanguaging “breaks down imagined boundaries between languages and recognizes multilingualism as one cohesive system”. But there is no tangible data to show how students understand the lesson

better. The data they presented are the perceptions of teachers on the use of translanguaging in teaching. Equally, in Daniel, Jimenez, Pray and Pacheco (2017: 5) findings, we are informed that “teachers scaffold the non-official classroom language to mediate learning through reducing learner frustration, helping learners understand” better. Yet the authors did not provide the learners with either formal or informal tasks to assess their understanding of the lesson. The data presented as prove of making the learner understand better are students responses to questions on their “experiences of translating for people in and out of school” (Daniel *et al* 2017: 8). Hamman (2018) also confirms that translanguaging makes the “students moved fluidly between English and Spanish to negotiate tasks” and understanding the content better. Unfortunately, the data presented as task are excerpts from students’ read-aloud text to enable them foster metalinguistic connections. There is no formal investigation of the students understanding of the lesson content. Escobar (2019: 295-296) also told us that by using translanguaging, students “demonstrated that they can skillfully and successfully employ the totality of their linguistic repertoire to discuss topics as abstract and complex such as human rights”. What is presented as data are students’ interactions with peers which allow them to juxtapose discourses. There was no formal task to assess their understanding. In a corresponding study, Romanowski (2019a: 21) informed us that the learners’ home language “facilitates and propagates a dynamic continuum of social and linguistic resources with the purpose of enhancing knowledge transmission in classroom instruction”. Also, Romanowski (2019b: 597) noticed that the practice of using the non-official classroom language “supports the acquisition and processing of the content” of the lesson. Unfortunately, both studies did not provide tangible/ cogent empirical evidences to support the claims.

Pollard (2002: 5) had earlier informed us that the deployment of the students’ home language assists “in the hopes of clarifying what had been missed in the class lessons” to make the student have an optimal understanding of the contents. The data provided is a language exchange between the teacher and students. But there was no specific task to investigate their understanding. Karlsson, Larsson and Jakobsson (2019: 20) say with the use of the non-official classroom language “students’ understanding of the subject will increase”. The data provided are excerpts of language practices of students negotiating subject specific terms. Formal task has not been presented as evidence. Creese and Blackledge (2010) informed us that the learners’ home language was drawn upon in order to make the students understand the content better in two complementary schools within Chinese and Gujarati speaking communities in the United Kingdom. But there is no real formal task as evidence to

support the statement. The data provided are excerpts from students' language practices in the classroom. In a related study by Simasiku, Kasanda & Smit (2015), we are told that the use of the non-official classroom language makes the learners to better understand the content of the lesson. The authors argued that teachers bring the home language of the learners into the for "better explanations, better understanding of the content by the learners" (Simasiku *et al* 2015: 73), but there was formal empirical evidence to support the claim.

The studies that actually provide evidence of knowledge claims seem to be in the area of language and relatively few in content subject. For example, in a study by Carroll and Morales (2016), we are told that translanguaging was used as a basis to make students understand the lesson. The assessment that was given to students is written reflections as formal assessment to demonstrate their comprehension of the lesson to "make connections among their group members by both speaking and writing while using Spanish, English" (Carroll and Morales 2016: 25). Musanti and Rodríguez (2017) inform us that the deployment of non-official classroom language makes the learners understand the subject matter better. Although the teacher engaged the pre-service teachers in writing task, it is to "develop their Spanish academic writing skills" (Musanti and Rodríguez 2017).

In the study by Kiramba (2016) the evidence provided shows that the students score low marks as a result of code-meshing of English and Kiswahili in their writing tasks. It then indicates that translanguaging did not assist them learn better. Similarly, Schissel, Leung, López-Gopar and Davis (2018) provide evidence using two parameters: control group and experimental group. The tasks are "double-rated using a binary yes-no checklist with six criteria". Likewise, Makonye (2019) (2019: 229) says "the home language assisted learners to understand both mathematics and the English in mathematics". S/he uses two experimental and two control groups to test the understanding of the learners. Using similar criteria, the evidence Herlina (2007: 127) provide consists of the number of "Indonesian words/phrases used by teachers in teaching English subject" and the students' scores. Makalela and Mgijima (2016) acknowledged that the non-official classroom language was used to make the students comprehend reading lesson better. Data evidence provided are tasks given to two groups: control and experimental groups. We are told that the "translanguaging intervention had a positive contribution to the participants' performance in the two languages" (Makalela & Mgijima, 2016:93)".

2.9 Repetition or Reinforcement in Multilingual Teacher-Talk

Although the “learners’ main language” (Setati, Adler & Bapoo, 2002:129) is being used, other important aspects of learning are reinforcement and repetition (Bromage & Mayer, 1986; Schwab & Lew-Williams, 2016; Haleem, Khan, Sufia *et al.* 2016; Saville, 2011; Saidi & Ansalod, 2017; Evidence-based teacher networks, 2017; Larriba-Quest, 2017; Hintzman & Block 1971). In other words, saying the same thing in different ways so that it will register in the learner’s mind.

The effect of repetition on learning as reflected in cognitive processes of attention, memory and retrieval is hypothesized in two ways by Hintzman & Block (1971). First is the strength hypothesis. Hintzman & Block (1971) argue that in the human memory there is one location for an event or idea. That location is called a memory trace. The authors claimed that every repetition of an idea has the effect of strengthening the memory trace representing that idea. Understandably, traces that are stronger are in turn more easily retrieved. The second is the multiple trace hypothesis which holds that every iteration of an event or idea creates a new memory trace. It is believed that learning is enhanced because one or a few of the multiplicity of traces can serve as suitable signal for the learner to secure understanding or recall of content. This means that “repetition would lead to increased retention” (Bromage & Mayer, 1986:271) and understanding by the child.

In language learning, “repetition has been seen as the most effective way to learn an L2 for functional use” (Saidi & Ansaldo, 2017:2). For example, in a study conducted on the importance of repetition in facilitating young children’s vocabulary learning across successive sentences, Schwab and Lew-Williams (2016) in the US explained how the structure of language input increases learning and whether the repetition of sentences can support young learners’ efficiency in learning new words. Drawing data from 40 participating children aged 24 to 35 months, the authors selected 25 girls and 15 boys who were all monolingual English speakers. Revealing that all the participating children did not have a history of hearing problems or any age-related challenges, Schwab and Lew-Williams adopted reinforcement or stimuli using three new words corresponding to three pictures of objects, each categorized using diverse colour, textures, and shapes. Schwab and Lew-Williams (2016:879) reported that successful learning took place “only when label pairs had been repeated in blocks of successive sentences”. This means that new learning had to be repeated in order to actually be remembered by learners. Likewise, Bromage and Mayer (1986) used quantitative and qualitative methods to examine the effects of repetition on

learning technical texts. Conducting three experiments involving 147 undergraduate students at the University of California, Santa Barbara, USA, they divided the students in different experimental groups. The materials used for the data were an audio-taped lecture, a subject questionnaire, and a recall post-test. The audio-taped lecture consisted of a 900 words. Bromage and Mayer (1986: 276) revealed that “repetition may help the reader discover the underlying structure of the passage and use that structure as a scaffolding for selecting and remembering the passage information”. Hence, repetition helps to reinforce learning in the mind of the child.

It has also been observed that reinforcement in learning increases “the likelihood that a newly learned behavior is repeated in future” (Haleem *et al.*, 2016: 2). In other words, learning new items has to be repeated and reinforced for it to be registered and understood. Repetition is a “fundamental teaching tool in the learning process” (Saville, 2011: 70). In the context of the linguistic heterogeneity across our classrooms, code switching and translanguaging are the multilingual models used in re-expressing the content lesson in the learners’ main languages in the class, since learners are not familiar with the official language of the classroom (Mokgwathi & Webb, 2013; Hornberger, 2002).

2.10 Functional allocation of languages in multilingual teacher-talk in classrooms

Many studies on multilingual classrooms have focused on multiple language use by teachers, and have concluded that there is a functional allocation of languages (FAL) in which language ‘a’ is used for instructional discourses and language ‘b’ is used for explanatory discourses. As our first research question suggests, it will be important to closely analyze these conclusions in light of current understandings of multilingualism. For instance, in reviewing code switching in the last 30 years, Lin (2013) provides an overview of the historical development of the various research patterns of code switching. Lin uses data obtained from Hong Kong schools in which classroom interactions were recorded using an audio tape recorder. Drawing on Guthrie’s (1984) function of code switching of L1–L2, Lin (2013) reveals that the function of L1 is used for clarification or checking the learners’ understanding of a concept presented in English. She further argues that in the classroom

code switching gives the teacher access to L2’s mediated curriculum by alternating to the students’ home language for the purpose of translating L2 terms or elaborating, explaining or simplifying L2 academic content (Lin 2013:8).

Macaro (2005:69) contended that the purpose of teacher code switching in the classroom is “giving complex procedural instructions” as the classroom is a community of language practices where both teachers and learners switch codes (Ríos & Campos, 2013).

From the US, Gort and Pontier (2013) explore bilingual pedagogies in two dual language preschool classrooms where there is a “language policy of separation”, paying more attention to how the teachers resolve bilingual interactions with emergent bilingual children of Spanish and English home language backgrounds. The authors selected four teachers, two from each preschool. Two teachers strictly adhered to the language separation policy. The four participating teachers were female Latinos and native speakers of Spanish and have degrees in childhood education. Using ethnographic tools, the authors used digital video recordings and fieldnotes as instruments for data collection for the period of six weeks. The video recordings were transcribed into texts. Gort and Pontier’s (2013: 236) results revealed that “drawing on both Spanish and English, teachers scaffolded students’ emergent language and literacy skills and further modeled the utility of bilingualism for constructing meaning”.

Martin–Beltrán (2010) in the US examined the nature of student interactions in a dual immersion school to analyze affordances for bilingual language learning. The study was conducted at the Escuela Unida, a dual immersion bilingual school located in an agricultural region in central California. The author focused on one group of 30 fifth-grade students. Data from audio and video-recorded interactions of students who engaged in joint writing activities (in Spanish and English) were sourced. The researcher also interviewed and surveyed students, teachers, parents, and the principal about language use of the school. Martin–Beltrán (2010: 262) reported that the students “code switch as a strategy to explain a new word (English to Spanish) drawing on two linguistics codes”.

In a similar study of bilingual education, Garcia and Bartlett (2007) conducted a widespread survey of Latino immigrants of Gregorio Luperon High School in the US. Data were sourced for the period of three years in ESL and Spanish classes focusing on seven focus groups. Garcia and Bartlett (2007: 13) revealed that Spanish and English in this school “exist in functional complementarity”. The authors noted that “teachers at Gregorio Luperon generally build on translation from the English of the textbooks to the Spanish of the classroom as a way to make sense of the academic material presented in the text” (Garcia & Bartlett, 2007: 15). This means that Spanish is used to explain the academic material presented in English.

In her doctoral dissertation, Seidlitz (2003) in the US researched patterns of language alternation in classes of German as a foreign language at the University of Texas at Austin. Using audio and video tapes, data were collected in second-year German language classes. Eight tutors were nominated to participate in the study: Renate, Bernd, Dieter, Julie, Melissa, John and Tom. Of the eight participating instructors/teachers, three were native speakers of German and five were native speakers of American English. Seidlitz (2003) balanced the gender equity with four males and four females. Using Myers-Scotton's Markedness Model as a framework, Seidlitz (2003: 66) revealed that in one of the lessons where Julie was teaching, "She began grammar practices in German (L2) but often switched to English (L1) in order to clarify rules".

In her article titled, *Smuggling the vernacular into the classroom: conflicts and tensions in classroom codeswitching in township/rural schools in South Africa*, Probyn (2009), explored the conflicts and tensions of code switching (caused by macro-level arguments around language status and rights) in a rural Grade eight English-medium classroom with Xhosa-speaking learners. Probyn (2009) reported that "teachers tended to teach new terms or concepts in Xhosa first and then transfer the understanding to English". She observed in most multilingual classrooms where the LoLT is not the home language of the learners, teachers tended to "rephrase in Xhosa new terms or concepts earlier presented in English for the purpose of clarification" (Probyn 2009:130). In the learners' group work, Probyn further revealed that "exploratory talk took place in their home language and presentational talk mainly in English".

Van der Walt (2009), in South Africa, described the functions of code switching in English language learning classes in 12 secondary schools and four primary schools in Somerset West, in the Paarl and Franschhoek areas of Stellenbosch. The data were collected in the third quarter of 2007 and 2008. At the time, the BEd and the PGCE students of Stellenbosch University were on their teaching practicals. Two sets of data were obtained: one by the researcher, and the other set were collected by PGCE students as part of their research assignments. Van der Walt compared and categorised the two field notes in terms of their functions. Van der Walt (2009: 36) reported that the "student teachers provide an Afrikaans explanation for a difficult English term or provide the Afrikaans equivalent when they saw learners did not understand the content". Teachers also used single lexical terms to clarify meaning when grammatical terms were used.

Probyn (2005) investigated the learning of science through two languages in township schools around Grahamstown, in the Eastern Cape Province, South Africa. The teachers and learners surveyed in the schools are home language users of isiXhosa. The study aimed to discover the perceptions, practices and problems of teaching using English as an additional language. The study is further located in four different schools. Probyn focused on six volunteer Grade 8 teachers, who were interested in the research. As the Language in Education Policy in South Africa provides for schools to enact / adopt their own language policies, Probyn observed that none of these four schools selected for the study had any language policy, but agreed to adopt English as the LoLT, for textbooks and testing as well. The author further observed four lessons for each of the six Grade 8 teachers. The teaching proceedings were videotaped and transcribed. Probyn (2005) reported that teachers consistently switched from English to Xhosa: “teachers switched to Xhosa if they saw the learners were not understanding a new concept or word” (Probyn, 2005: 1864). She also revealed that “teachers presented their lessons mainly in English with some code-switching to isiXhosa to achieve a range of cognitive and linguistic aims” (Probyn, 2005: 1866).

Chikiwa and Schafer (2014) critiqued the use of English in teaching mathematics in three grade 11 multilingual mathematics classes in the Eastern Cape province of South Africa. The authors observed each teacher in five lessons for the period of one week. The authors’ aim was to investigate the code switching practices of the three teachers who were IsiXhosa first language speakers, and to pay more attention to the consistency and accuracy in the use of IsiXhosa in teaching. Data were collected using video recordings of lessons. Transcription of the videos into texts was done for easy analysis; the researchers also interviewed each teacher during a follow-up on the lesson taught. Chikiwa and Schafer (2014) claim that the teaching of mathematics using English as language of teaching and learning continues to pose problems for learners whose mother tongue is not English. Using three research questions to interrogate the use of code switching in the classrooms, Chikiwa and Schafer (2014: 146) reported that all the teachers in the study “used IsiXhosa predominantly to ask questions and for the purpose of explaining concepts”.

Banda (2010) outlines how bilingual / multilingual learners and teachers challenge the monolingual discourses prescribed in language education policy. He visited and surveyed nine multilingual coloured schools on the Cape Flats of Cape Town. Seven of the schools selected for the study were primary schools (Grades one to seven), and two were secondary schools (Grades eight to twelve). Banda (2010: 231) reported that “teachers strategically

alternate between English and Afrikaans or English-Afrikaans mixed code to enhance learning”.

In research titled *Teaching mathematics in a primary multilingual classroom lesson*, Setati (2005) explored the complex relationship between language and mathematics education in multilingual settings in an African township west of Johannesburg, focusing on Grade 4. She referred to the learners’ home language as the language of conceptual discourses, and English as the language of procedural discourses (Setati, 2005: 460). By conceptual discourses, she means discourses by which teachers and learners “articulate, share, discuss, reflect upon, and refine their understanding of mathematics” (Setati, 2005: 449). Procedural discourses refer to discourses that mainly focus on the steps and processes used to solve mathematical problems. The participating teacher (Kuki) and her learners were Setswana home language users. In addition, the teacher (Kuki) spoke three other languages – English, Afrikaans, and Sesotho. Setati (2005:460) observed in the lesson that Kuki consistently used “The Learners’ Home Language as the Language of Conceptual Discourse” (Setati, 2005: 460), that is, a language in which explanations are requested and provided.

A survey conducted by Probyn (2006) investigated the classroom language practices of six Grade 8 science teachers in township schools around Grahamstown, Eastern Cape, who volunteered to participate in the study. Four lessons for each of the six Grade 8 teachers were videotaped. Data recorded from teachers’ lessons, and questionnaire interviews were all transcribed and analyzed. The results revealed that “generally teachers tended to teach new concepts in Xhosa and then translate these into English” (Probyn, 2006: 403).

In their article *Incomplete Journeys*, Setati, Adler, Reed and Bapoo (2002) sought to illustrate code switching and other language practices in mathematics, science and English language classrooms in South Africa. Drawing their data from a 1996 research project conducted using in-service teachers on a training programme at the University of Witwatersrand, the significance of dialogue in the classrooms was highlighted. Participants were drawn from ten rural and urban primary and secondary schools in the Northern Province and Gauteng. The authors identified two types of talk that learners need to know: exploratory talk and discourse-specific talk. The exploratory talk referred to part of the talk that is done in the learners’ language, whilst the discourse-specific talk is the academic talk which is centred on the school curriculum. Data of selected lessons were collected using a video recording machine. Setati, Adler and Bapoo (2002: 138) reported that “teachers used English

predominantly and they switched to learners' main language(s) for reformulation in ... whole-class teaching”.

Probyn (2004) scrutinised what teachers actually do in their classrooms and drew on the expertise of experienced science teachers teaching through two languages. Grade 8 science classrooms were selected for the study. Six teachers volunteered to participate in Mzamo (a fictitious name) Senior Secondary School, based in the Eastern Cape. Probyn (2004: 4) reported on the code switching practices of teacher C and says “Teacher C’s lesson consisted of exposition – reading a chunk of English from the textbook (only she had a copy), and translating and explaining in Xhosa”.

Earlier, Probyn (2001) explored the perceptions and practices of teachers who teach using English as an additional language. In order to have a wide-ranging research, the author selected five disciplines: mathematics, accounting, science, business economics and history, in township schools in South Africa. Teachers selected for the study had to share a common mother tongue with their students. Data were sourced through interviewing teachers about their perceptions of teaching through the medium of English as an additional language. Probyn (2001: 258) put forward that “Teachers switched from English to Xhosa, to explain new words or concepts”. From the interview, the accounting teacher disclosed that “When I’m introducing some terms to them I introduce it in English and then I have to translate them in Xhosa, that is for them to understand”.

Setati (1998) conducted a study on code switching in a primary school class of second language mathematics learners at a farm school west of Johannesburg. The study specifically focused on Grade 5. In this Grade 5 class pupils did not have their own textbooks, only their exercise books in which they did their written work. There were 33 pupils in the class and all second language speakers of English, as they were first-language Tswana speakers. The volunteering teacher, Thato, was multilingual and spoke the same language as the pupils. The teacher possessed a recognized teaching qualification. The students were arranged in groups of five or six. Each group was given a different activity to do. The class activities were audio recorded and transcribed. In a specific scenario / activity, a student, Jacob, did not observe the instructions after they were given in English, and as a result Thato interpreted this action as a lack of understanding and reformulated it into Tswana – “Thato uses code switching (English to Tswana) to clarify instructions” (Setati, 1998: 38).

Zazkis (2000) described the importance of code switching in teaching mathematics to pre-service elementary school teachers in South Africa. He sourced the data over a period of four years from a course the author taught, 'Principles of mathematics for teachers', for pre-service elementary school teachers. Twenty teachers from each set volunteered to participate in what he termed "a clinical interview" study (Zazkis, 2000:39). This clinical interview is a type of questionnaire designed to investigate the learning number theory. Zazkis (2000: 38) indicated that "teachers were observed to switch codes in order to translate or clarify instructions but also to reformulate and model appropriate mathematical language use".

From Tanzania, Shartiely (2016) examined code switching between English and Swahili in lectures at the University of Dar es Salaam. Audio recordings of 55 minutes for each lecture were collected in four courses from four lecturers. Shartiely (2016) revealed how lecturers switch code to clarify. Reporting on a particular lecturer, the author says "She codewitches (from English) to Swahili to clarify" (Shartiely, 2016: 222).

Martin (1999: 47) observed in Brunei that, in multilingual classes where teachers and learners interacted with monolingual texts, "In the introductory interaction with text, which was always teacher-initiated, English was the preferred language".

From Botswana, Mokgwathi and Webb (2013) surveyed the educational effects of code switching, specifically within the context of the classroom. Botswana has about 28 living languages, including English and Setswana (Batibo, 2006; Ethnologue, 2010). However, English is the official language of instruction in education from primary to tertiary level, while Setswana, the national language, is taught as a subject. Mokgwathi and Webb (2013) obtained data from four senior secondary government schools located in north-eastern Botswana. From these schools, first and second schools are located in an urban centre, and the third and fourth schools are located in two semi-urban towns. There were 130 teachers who voluntarily participated and 2763 students were involved in the study (i.e. 40 students per school). The authors sourced data through classroom observations and audio tape recordings. Four subject areas were in focus: English Language/Literature, history, home economics, and biology. Mokgwathi and Webb (2013: 119) reported that, in the biology lesson, "the teacher initially used more English than Setswana and there was no response from the class, however, when she code-switched to Setswana to explain the filtration process, the learners joined in and participated in the lesson".

Yevudey (2013) studied classroom code switching by exploring the pedagogic functions of patterns in both Ewe (L1) and English (L2) in two mission primary school lessons in Ho Township of the Volta Region in Ghana. The data for the research were derived from recordings of classroom discourses, responses to a questionnaire, and interviews. Four teachers, with an average of 20 pupils per teacher, participated in the study. Yevudey (2013) observed in a social studies lesson about road safety, when the “teacher realised that the pupils did not understand the question in English, she switched to Ewe using inter-sentential code switching and intra-sentential code switching in order to explain” (Yevudey, 2013: 8). The teacher, who is “keen to use unilingual English, recognizes the importance of the L1 (Ewe) for explaining incomprehensible concepts to the pupils” (Yevudey, 2013). Yevudey further added that “teachers used code switching through translation of English statements or words into Ewe” (Yevudey, 2013: 13).

Addressing the contradictions surrounding bilingual teaching in post-colonial Burundi, Ndayipfukamiye (1996) examined the language practices of teachers and learners in both rural and urban school areas, where Kirundi language became central to post-independence nation-building. He obtained data from his wider research project of bilingual classroom discourse in primary schools Burundi in 1991. The data, which was audio recorded, consisted of teacher / learner exchanges during French vocabulary lessons, *From Nyakatsi to Maisons en Etage*, with Grade 5 learners in two schools. The two languages used in these classes were Kirundi and French. Ndayipfukamiye (1996:42) noted that teachers “code switched frequently between French and Kirundi while they were explaining”. He added that “both teachers opened the teaching/learning exchanges in French, but then switched into Kirundi to elaborate on the information” (Ndayipfukamiye, 1996: 43). The author further revealed that “the new terms were presented in French, and then the teacher provided explanations and commentary in Kirundi” (Ndayipfukamiye, 1996: 45).

In a work titled, *Code Switching and Collusion: Classroom Interaction in Botswana Primary Schools*, Arthur (1996) adopted an ethnographic study to examine the language practices and interactions between teachers and pupils in two Grade 6 classrooms. Data in this article were drawn from audio recordings in the lessons. Arthur (1996:27) noticed that the teacher in one of the selected schools “attempts to clarify her focus by code switching into Setswana: she gives a literal Setswana translation of the English sentence offered earlier by a pupil”.

From Europe, Edvinsson (2015) studied teachers' code switching in upper secondary ESL classrooms in Sweden. Focusing on only one teacher, data were collected using an audio recorder. The recorded interactions were then transcribed. Adopting Jefferson's convention for the data analysis, Edvinsson extracted relevant excerpts where the teacher code switches. Edvinsson (2015: 18) observed that the teacher code switched from English "to Swedish to help scaffold learning when introducing new vocabulary". He also noticed that the teacher used code switching as a "scaffold for learning, where it can be used as a tool to make explicit cognitively difficult concepts or instructions" (Edvinsson, 2015: 17).

Johansson (2013), in Sweden, reviewed code switching in English as a foreign language by assessing the reason why teachers in upper secondary schools code switched when teaching L2 English. Using five teachers of English in Grades 5 and 6, Johansson (2013) prepared questionnaires in English and Swedish for both teachers and students. The results showed that one of the teachers, Dana, used a "prepared code switching from English to Swedish language when she teaches grammar, explains the content and purpose of the syllabus" (Johansson 2013:9). Initially, the teachers who participated in the study claimed that Swedish does not belong in the English classroom, however, they code switched in grammar teaching and "look[ed] at Swedish as functional in some situations" (Johansson 2013:9).

Diana-Lee Simon (2001), in Thailand, explored new understandings of code switching in the foreign language classroom. Simon (2001) focused on the learning of two different languages in different environments: the teaching of French in secondary schools in Thailand by non-native speakers of the target language, and the teaching of English in secondary schools in France by non-native speakers of the language. Simon (2001: 325) reported that "for the grammatical explanation, it is the native language Thai whereas, for the oral production task (.) the teacher clearly chooses the foreign language as the matrix language".

Studying the teaching of the Japanese language in the United Kingdom, Hobbs, Matsuo and Payne (2010) sought to describe the underlying purposes of code switching practices by the teachers. Four Japanese secondary school teachers were recruited for the study (Katsumi, Saki, Jeremy and Jane): two native Japanese speakers and two British non-native speakers. Taking Saki's class, in particular, Hobbs, Matsuo and Payne (2010: 52) revealed that the lesson involved the "explanation of Japanese verb forms in the students' L1 (English)".

Camilleri (1996) in Malta sought to describe the language values and identities using code switching in secondary classrooms. Although the author reveals that Malta does not have an official language policy drawn up for schools, what he did was to investigate how teachers and learners achieved lessons bilingually in the absence of any official policy on the medium of instruction. Moreover, in Malta, “secondary education is taught in two languages: Maltese and English” (Camilleri, 1996: 85). In the course of the study, Camilleri noticed that code switching between Maltese and English was a common practice in interactions between teachers and learners in the classrooms. He reported that “written texts in English are ‘translated’ into spoken texts in Maltese” (Camilleri, 1996: 96). He further noticed that “the details of the problems that were read out in English from the textbook were discussed in Maltese” (Camilleri, 1996: 96).

Chowdhury (2013) in Bangladesh described classroom code switching of English language teachers at tertiary level, focusing on the reasons for teachers’ code switching and the attitudes of both the teachers and students towards classroom code switching. Bangladesh is a monolingual country with only Bangla being spoken. Chowdhury (2013) conducted a survey on 20 English language teachers randomly selected. A total of 37 students participated in the survey from three universities: Stamford University Bangladesh, United International University, and Dhaka University; two of the universities are private and one public. Chowdhury (2013) then drew up two different sets of questionnaires as instruments for data collection. At the end, he put forward that “To explain new and difficult concepts, teachers often switch codes (from English to Bangla)...while repeating or reinforcing any part of the lesson, defining or explaining a terminology, the teachers often take help of code switching” (Chowdhury, 2013: 48). Chowdhury (2013:50) revealed that “In the grammar classes the teacher may often take help of the native language to make students understand complicated and confusing grammar topics”.

Adriosh and Razi (2019), from Libya, investigated the actual situation of code switching in EFL undergraduate classrooms in Libyan universities. Deploying four different instruments to collect data, six EFL teachers from three universities and their students participated. The lessons were audio-recorded which comprised of two class sessions for each teacher. They further carried out semi-structured interviews with the teacher and a few students. Mohamed Adriosh and Özge Razi (2019: 5) reported that “The teachers mostly used L2, but switched frequently to L1” to clarify concepts.

In Pakistan, Bhatti, Shamsudin and Said (2018) explored the teachers' use of code switching as a language teaching tool in EFL classrooms. They derived their data from the observation of four teachers who were training diploma students in the National University of Modern Languages (NUML). The lessons were audio-recorded and transcribed into texts. They selected teachers who were graduates of MA and M.Phil. Bhatti, Shamsudin and Said (2018: 98) revealed, in particular, that Teacher A “code-switched frequently (from English to Urdu) whenever she felt that there were some difficult or important points to explain”. The authors concluded that code switching is inevitable because most students lack competence in the English language.

Grant and Nguyen (2017) in Vietnam discussed the pedagogical perspective of the practices of code switching by Vietnamese university EFL teachers in their classrooms. Twelve teachers were selected to participate in this study, eight female and four male participants. Data were collected through classroom observations, class recordings and interviews with teachers, as well as field notes. Twenty-four class hours of the twelve teachers – two classes for each – were observed and recorded on a digital voice recorder. Grant and Nguyen (2017: 250) report that “the EFL tertiary teachers in Vietnam code-switched from English to Vietnamese in order to make their teaching of important concepts such as grammar and vocabulary clear”.

Cahyani, de Courcy and Barnett (2017) in Indonesia examined the reasons behind teachers' code switching in tertiary bilingual classrooms. The research site was a bilingual programme at a State Polytechnic, in East Java, Indonesia, where the bilingual English programme “was intended as the main medium of instruction, but the classroom participants were still allowed to use Bahasa Indonesia” (Cahyani, de Courcy and Barnett, 2017: 8). Three teachers were randomly recruited to participate in the study. Cahyani, de Courcy and Barnett (2017) observed lessons in accountancy and business administration. Using both video and audio recordings, data were sourced in three classrooms over one semester. Cahyani, de Courcy and Barnett (2017) also engaged teachers in semi-structured interviews. Instances of code switching in the transcripts of classroom interaction were examined using both Interactional Sociolinguistics (IS) and functional categories of code switching. Considering the compartmentalization of languages in multilingual classroom teacher talk, Cahyani, de Courcy and Barnett (2017) outlined four functional categories of code switching. One of the categories is ‘knowledge construction’ from which they report that “teachers typically

switched out of English into Bahasa Indonesia to ensure that students would understand their explanations more easily” (Cahyani, de Courcy and Barnett, 2017).

In a study focusing on the way learners in classroom discourse draw on the languages in their repertoires, Martin (1996) describes how teachers and students in Brunei switch between the use of English and Malay in content lessons. Martin (1996) specifically focused on the occurrences of code switching in a primary school in Brunei, Darussalam, paying more attention to the sequences of language practice in Primary 4 and Primary 5 classes. Deriving his data from three schools, he observed and recorded 18 content lessons (history, science, mathematics and geography). He observed that the two languages were used separately (English and Malay). Martin (1996: 137) argued that teachers “code switch from English to Bahasa Malay to give the meaning of a word or lexical items”. Martin (1996: 17) further posited that “teachers also attempt to explain by using the first language to clarify difficult concept”.

On their part, Rezvani and Rasekh (2011) conducted an explanatory investigation on code switching in Iran in English language classrooms. Data were drawn from four schools in Isfahan, Iran. Four teachers volunteered to participate in the survey, one from each school. The authors sought to identify the kinds of switches that occur in the lessons and the functions of such switches. Twenty students were also selected to participate in the study. Using an audio recorder, data were collected through the recording of teachers’ interactions for 90 minutes, three times a week. The audio-recorded teachings were transcribed into texts. The instances of code switching in the texts were analyzed using the data-driven methods (Rezvani & Rasekh, 2011: 19). Rezvani and Rasekh (2011) reported that “teachers used CS to ensure students’ understanding by means of translation” and “translation was observed frequently (from English to Farsi) in all the classrooms when the teacher seemed to find it more effective than other strategies such as miming or paraphrasing” (Rezvani & Rasekh, 2011: 21). They also observed that the four teachers “use code switching to elaborate on important points, especially while teaching the target language grammar...the teachers resorted to L1 and explained rules of grammar mostly in Farsi” (Rezvani & Rasekh, 2011: 22). In other words, the teachers code switched from English as EFL to Farsi, the home language of learners, to explain and elaborate an important point. Therefore, there is a language hierarchy in the lesson.

Hussein (2013) in Jordan undertook a field study to unfold the purposes of using the mother tongue in teaching English as a second language to Arab students. The study was

conducted in three Jordanian universities from where data were derived from 120 students and 12 teachers. In observing the teachers and students in real classroom interactions, Hussein reported that “the greatest percentage of time spent by all teachers using Arabic was used for explaining new or difficult words, followed by explaining syntactic rules, explaining difficult questions” (Hussein, 2013: 177). This study further indicated that English was used to introduce the academic content, whereas Arabic was for simplifying the lesson.

In a bid to find out how ESL learners react towards code switching in the classroom, Nordin, Ali, Zubir and Sadjirin (2013) engaged 45 second semester diploma students from the Faculty of Applied Sciences, University Teknologi MARA Pahang, in Malaysia. Even though the National Education Policy of Malaysia states that Malay and English are to be taught and used in all schools (Nordin *et al.*, 2013:480), Chinese, Indian, and other ethnic minority languages are represented in the classroom. Nordin *et al.* (2013: 483) noticed that teachers often code switched “to facilitate understanding and building of vocabulary”.

Herlina (2007) corroborates the functional allocation of language in a study she conducted in Indonesia on the teachers’ use of code switching in the classroom. The aim was to gain a deeper understanding of code switching as one medium of English instruction and its related effects on learners’ assessment. Herlina (2007) selected eight teachers who teach English to non-English students at the Bina Nusantara University, in Jakarta. Using both qualitative and quantitative methods of analysis, the classroom practices were audio recorded. Herlina (2007: 121) reported that “the teacher gives the instructions, first in English and then translates them into Indonesian”.

Likewise, Mokhtar (2015) in Malaysia attempted a discussion on whether there were differences in the belief between lecturers and their students. Observing the language practices of three lecturers, audio-recorded lessons were analyzed using a purposive sampling in the Civil Engineering Department of Politeknik Ungku Omar in Perak, Malaysia. In the end, Mokhtar (2015:90) submitted that “the lesson took place mainly in English (...) the teacher switched to Malay to help his students understand his explanation”.

Tien (2009) in Taiwan explored the nature of classroom talk, focussing specifically on how teachers and learners use more than one language to talk around monolingual textbooks. Two teachers and 107 student participants were selected for this study (37 male students and 70 female students) from different levels from the University of Technology Kaohsiung in southern Taiwan. Data were collected using observations, field notes and audio recordings,

and three different sets of group interviews. Tien (2009:179) reported that “teachers often switch from English to Mandarin to explain the content of the textbook to students”. He emphasised that “to introduce new words, the teacher accentuated the key lexical items and wrote them on the board. The teacher then used Mandarin to translate, explain and review the key words” (Tien, 2009: 179).

Lin (2006) examined bilingual pedagogies in a science classroom in Hong Kong and reported that “English (the students’ and teachers’ L2) was found to be associated with text-dependent, formal, didactic and memory-based functions; whereas Cantonese (the students’ and teachers’ L1) was found to be associated with explanatory and understanding-based functions” (Lin, 2006: 294). He also reported that when the “teacher requires to explain any concepts in the text, the teacher will switch to Cantonese and ask questions related to students’ experience in Cantonese (in a more ‘informal, explanatory’ mode)” (Lin, 2006: 294).

Jegade’s (2012) study revealed evidence of functional allocation of language from teachers’ and students’ interactions in the class when he investigated the roles of code switching in five multilingual public primary schools in Ile-Ife, South-West, Nigeria. The study sought to determine the outcomes of the languages used in teaching and learning mathematics. Jegede (2012) used ethnographic observation and both structured and unstructured interviews to source for data. Five mathematics teachers (one from each school) and 50 pupils from the five purposively selected primary schools (ten from each school) agreed to participate in the study. Jegede (2012) posited that the five schools selected for the study represented the three major languages in Nigeria. The Anglican Central School, Sabo, and St. Peters Primary School, Sabo, are situated where people of Yoruba origin live; A.U.I. Primary School, Sabo, and Methodist Primary School, Sabo, are schools where people from Hausa origin are dominant; and St. Bernard’s Primary School, Lagere, is positioned where people from Igbo descent live. After the data was collected, the author used Myers-Scotton’s Matrix Language Framework model to analyze the data. Jegede (2012: 42) reported that, in most of the schools surveyed, “teachers simply use Yoruba to translate each sentence they uttered in English”. He further revealed that in Anglican Central Primary School, Ilare, Ile-Ife, “the teachers switched from English to Yoruba to elaborate on the topic they are teaching” (Jegade, 2012: 43).

In a positioned paper, Modupeola (2013) in Nigeria critiqued the teachers’ use of code switching as a means of providing students with the opportunity to communicate and enhance

understanding. He posited that “the teacher use code switching by starting the lesson in the English Language and may move into the second language (Modupeola 2013: 93).

Igboanusi and Peter (2016) investigated the roles of various stakeholders in education. Data was sourced from a range of possibilities: observations of classroom language practices of teachers and students; semi-structured interviews with administrative officers of four leading publishing companies; and interviews with teachers and minority language activists. Classroom observations were conducted in Edo, Imo, Nasarawa, Kano and Oyo States. There are 100 instances of observations of 20 schools which the authors purposively selected and observed per state. One-hundred teachers (50 in public, and 50 in private schools), 50 parents, and 50 officials of the State Ministry of Education were elected to complete the questionnaires. The authors nominated areas in which different languages were dominant, including Imo (for Igbo), Kano (for Hausa), Oyo (for Yoruba), Edo (for southern minority languages), and Nasarawa (for northern minority languages). Igboanusi and Peter (2016: 566) reported that in the public schools in the Southwest (Ibadan, the capital of Oyo), teachers “give notes in English and explain either exclusively in Yoruba or in a mixture of both Yoruba and English”. In the Southeast and in Imo State, in particular, “schools mostly in rural areas use Igbo to explain some difficult terms which they assume will be better understood if explained in Igbo” (Igboanusi & Peter, 2016: 567). In Kano State (Northwest), they noticed “that Hausa was used in some rural schools to teach English” (Igboanusi & Peter, 2016: 568).

Igboanusi (2008) in Nigeria explored the attitudes of students, teachers, parents and school administrators towards bilingual schooling. His data were drawn from a questionnaire which consisted of six items with open and close typed questions. Igboanusi used ten research assistants to help in the administration and collation of data. One-thousand questionnaires in five states in Nigeria were distributed: 25 questionnaires for each state. The writer used a simple percentage to analyze the data. Igboanusi (2008) revealed that “teachers teach the subject or topic of the lesson in English and use Yoruba (in the case of Oyo, South west) or Igbo (in the case of Imo, South East) to give explanation” (Igboanusi, 2008: 730).

Okebukola (2012) in Lagos, Nigeria, studied the views of Nigerian teachers in public and private primary schools on the teaching of literacy in English. He paid particular attention to Primary 4 classes from where data were collected from 30 teachers. As the Nigerian National Policy on Education recommends that the language of teaching and learning from Primary 1 to 3 should be the mother tongue or the language of the immediate environment of the child,

from Primary 4 through to university, English should take over (NPE, 2013:8). The language of the environment where the author conducted the research was predominantly Yoruba. Okebukola (2012: 99) reported that “teachers translate discussions of the lesson into the learners’ home language for concept formation in public and private primary schools”. Still, this study shows a functional allocation of language.

Salami (2008) in Ile Ife, Southwest, Nigeria, where Yoruba is also the dominant language, explored language practices in 20 primary school classrooms. In Bernard Primary School in Lagere, English, Yoruba, Hausa, Igbo and Edo language learners were represented in the classes. The author disclosed that teachers in English and mathematics lessons consistently used code switching to alternate between English and Yoruba: “The Yoruba language was used to interpret the contents of the lessons, explain points, or make clarifications” (Salami, 2008: 102). The Methodist Primary school in Sabo Ile-Ife, where the majority of the community is Hausa-speaking, has a high population of Hausa learners. In the lessons, Salami observed code switching was used in most of the lessons. Reporting on the activities of the teacher in a Primary 3 social studies lesson, Salami (2008) noticed that the teacher used three languages, English, Hausa and Yoruba: “Although she gave the content of the lesson-Division of Labour-in English, she did clarifications and exemplifications in both Yoruba and Hausa within the lesson” (Salami, 2008: 103).

Adewuyi (2002) in Osun State, Nigeria, compared the effectiveness, characteristics and classroom interaction strategies in the United States and Nigeria. Observing a particular teacher in a physics lesson, Adewuyi (2002: 279) reported “instances of teachers teaching the contents in English but switch to Yoruba to explain unfamiliar and difficult concepts”. He further revealed that “when the teacher realized that students do not understand the concept, the teacher changed to Yoruba language to simplify and explain the concepts” (Adewuyi, 2002: 279).

Setati (2005) and Planas and Setati (2009) used the terms conceptual discourses and procedural discourses. For instance, Planas and Setati (2009) explored language diversity and language contact focusing on Catalan migrant bilingual learners learning mathematics in a Spanish environment, and pointed out that for the “conceptual discourse the teacher uses Catalan but for the procedural discourse the teacher uses Spanish” (Planas & Setati, 2009: 50). Similarly, Setati and Adler (2001), in South Africa, observed that the procedural steps which were being used to solve mathematics problems was in the official classroom language

(English), whereas for the conceptual discourse, the teacher used the learners' home language (isiXhosa).

Some conceptual framework for processing the above accounts can also be obtained from work by Christie and by Cummins. Christie (1997) employed the terms "regulatory discourse" and "instructional discourse". This means that in multilingual classrooms, for instance, in the regulatory discourse the teacher uses the learners' home language, and for the instructional discourse, the teacher uses the official classroom language. In this scenario, languages are kept separate.

Cummins (1984:12) made a distinction between "basic interpersonal communication skills (BICS)" and "cognitive academic language proficiency (CALP)". He argues that BICS is the surface skills of listening and speaking which are typically acquired "quickly in learning second language", while CALP is the academic language which supports the child's ability to cope with the academic demands of various subjects (Cummins, 1984:12). In a multilingual school environment, for BICS, the teacher employs the learners' home language to discuss classroom arrangement, and for CALP, the teacher uses the official classroom language.

Whether it is code switching or translanguaging, the use of multilingual resources in the classroom discourses has been associated with a number of advantages. Some of the advantages of the use of multilingual resources are that it deepens learning (Pollard, 2002), facilitates participation of the learners (Mokgwathi & Webb, 2013:108), creates the psychological environment for the learner, and it also helps to develop the official language of the classroom. For instance, drawing on the concept of translanguaging as a lens, Schissel, Korne and López-Gopar (2018) explored the role of multilingualism in classroom assessment, in which they analyzed the perceptions and practices of teachers. About 22 MA students from the Faculty of Languages at the University of Oaxaca, Mexico, who were practising language teachers, were selected as participants of the study. Data was collected through engaging teachers in discussions and teachers' reflections. The interactions were video and audio recorded, and field notes were also used as data. Schissel, Korne and López-Gopar (2018:10) reported that "in describing their choice to use Spanish and English with the assessments, the group of participants explains how translanguaging was seen as a strategy or skill that they purposefully used to help students understand the requirements of the assessment".

2.11 Criticisms of Translanguaging

There have been some criticisms of translanguaging of late (Ticheloven, Blom, Leseman & McMonagle, 2019; Bhatt & Bolonyai, 2019; Jaspers, 2018; Kiramba, 2016). In criticizing classroom translanguaging, Ticheloven, Blom, Leseman and McMonagle (2019) in the Netherlands investigated the challenges associated with pedagogical translanguaging in multilingual classrooms where teachers are not able to speak the learners' languages. The authors visited four schools in the cities of Gorinchem, Utrecht, and Rotterdam. Two of these schools were established for the purpose of providing education for newly arrived immigrants, and the other two are international schools with English as the language of teaching and learning. Ticheloven *et al.* (2019) collected data from numerous stakeholders who were assumed to have come across translanguaging in education in different ways. Ticheloven *et al.*'s (2019:10) results revealed that the use of "other languages in the classroom prevent teachers from keeping track of what students are doing (...). Some teachers described feelings of discomfort when they do not know what students are discussing in class time". This could hamper smooth teaching and learning in the class. Moreover, students who need to practise and engage in "translanguaging would need to practice the standard language for academic purposes" (Jasper, 2018:6). Equally, it has been observed that the claims that translanguaging moves 'beyond named languages' and creates new language practices (Garcia & Othguy, 2019) and that "teachers successfully drew on English and Spanish to communicate across linguistic differences, affording students greater access to content are not empirically supported" (Allard, 2017:127). It certainly does not "enhance any theoretical understanding of bilingual language use beyond what the sociolinguistic studies of code-switching have offered" (Bhatt & Bolonyai, 2019:19). Karimba (2016:12), in Kenya, examined translanguaging in the writing of emergent multilinguals, and reported on one learner (Adila) that "Her TL (target language) strategies help a multilingual reader to understand her text, but due to language restrictions she receives a low score". Kiramba's concern is that monolingual language policy in multilingual school spaces is an obstacle to learners which inhibits them from exercising their full repertoires in biliteracy. Jaspers (2018:9) summed it up thus: "Enlightened principles value linguistic separation and diversity, and that at the end of the road, pupils will be evaluated for their skills in a monolingual, academic type of language", as the language of examination is the official classroom language.

2.12 Summary of the Chapter

Firstly, the chapter began with an overview of Nigeria's system of education, and we acknowledged that the structure of language in education, as spelled out in the National Policy of Education, does not provide the learners the adequate atmosphere to learn. Secondly, we reviewed research that indicated a drastic drop in students' performance in English and science subjects in the end-of-high-school examinations. We also appraised the various attempts by scholars to address the low proficiency of English through developing the content of English for academic purposes, yet there has been no interest in multilingual discourses.

This chapter further focused on reviewing literature on linguistic diversity in the classrooms. We found that, in most of the research focusing on linguistic diversity in the classrooms, there are speakers of different languages represented in the classrooms. We then looked at migration as the greatest agent of making the classroom a multilingual space. We also argued that the choice of multilingual teacher-talk is significant, given Nigeria's diverse linguistic configuration in Africa, and considering the attendant effects of monolingual teaching and learning on the performance of the students in various public examinations.

We also highlighted literature addressing diversity in the classroom either through linguistic means or organisation of classroom interactions. Among others, we reviewed the interactional schemes of Sinclair and Coulthard, Christie and Lemke. We also reviewed Baker's (2006) bilingual models which drive the learners into ultimately becoming monolingual speakers. Finally, we examined code-switching and translanguaging in depth. In the next chapter, we introduce the theoretical frameworks for this study.

CHAPTER 3: THEORETICAL FRAMEWORKS

3 Introduction

This chapter examines the two major theoretical frameworks on which this thesis is based. They are Legitimation Code Theory (LCT), and Terminology Theory (TT). Both theories are interconnected in the sense that they conceptualize knowledge in education and beyond from a social point of view. In other words, the two theories are interdependent since both consider knowledge in the classrooms as an integral part of the interactional processes in teaching and learning. While LCT helps to code knowledge in teacher talk in the classroom or text, Terminology assists in identifying the units of knowledge in teacher talk. Under LCT, we look at the dimension that is appropriate for our study and its various coding toolkits (Maton, 2013). With regards to Terminology, we explain various types of units of knowledge as presented by Antia (2000), Sager (1990), and Wright (2001). Finally, the relevance of the frameworks to this study is highlighted with a few examples of studies in which LCT theory have been used are presented and discussed.

3.1 Legitimation Code Theory

Legitimation Code Theory (LCT) is a social realist framework developed by Karl Maton, an Australian sociologist, to address the obscurity of knowledge in educational research. It is a coalition of approaches that construe knowledge as both socially produced and real in the sense of having effects (Maton & Moore, 2010). Maton's LCT has been influenced by three theoretical foundations. The first theoretical foundation is critical realism. This approach indicates that there is more beyond and beneath the surface of what is represented in discourses that research needs to uncover. In other words, "there exists a reality beyond our symbolic realm" (Maton & Moore, 2010: 4). The second theoretical foundation that influenced the development LCT is Bourdieu's (1990) habitus theory of field of practice, in which Bourdieu observed that society is seen as a field where members of the field try to maximize their positions in the field in contest for ownership, authority and status (Arbee *et al.*, 2014:42). The third theoretical foundation that has also influenced Maton to develop the LCT toolkits is Beinstein's (2000) famous code theory which distinguishes between 'horizontal discourse' (that is, everyday knowledge or common sense knowledge), and 'vertical discourse' or specialized knowledge (Maton, 2013:10).

Maton (2013, 2014a and 2014b) argued that, despite the fact that we live in the knowledge age, “knowledge has been analytically under-explored and under-theorized in empirical research” (Maton 2013: 9). This is because “knowledge as an object is missing from approaches that have dominated the sociology of education. (And) Having a *theory* of knowledge is not a necessary condition for having knowledge itself” (Maton & Moore, 2010: 2). LCT, therefore, is developed to address this ‘knowledge-blindness’ by offering a toolkit for exploring and analyzing the organizing principles that underline practices in education and beyond.

There are five dimensions of LCT:

- a) Specialization dimension, which explores the epistemic, social and knowledge, knower relation within practice. This dimension of “Specialization begins from the simple premise that every practice is about or oriented towards something and by someone” (Maton and Chen, 2020: 38);
- b) b) Autonomy dimension indicates that “any set of practices comprises components that are related together in particular ways” (Maton & Howard 2018: 6). That is, Autonomy dimension explores how different knowledge practices are being integrated (integrated knowledge building) to bring about better understanding of a constituent. Maton & Howard (2020: 5) argued that “The constituents could be actors, ideas, institutions, machine elements, body movements”
- c) Density dimension which examines forms of knowledge and communities of practitioners has “Received relatively little attention as yet. Likely to be renamed ... to avoid confusion with semantic density” (Maton 2016: 238);
- d) Temporality dimension examines temporal position and orientation of actors in a field of practice. Maton (2016: 243) reveals that the Temporality dimension “explores practices in terms of their temporal features whose organizing principles are given by *temporal codes* that comprise strengths of *temporal position* and *temporal orientation*” and
- e) Semantics dimension regards “social fields of practice as *semantic structures* whose organizing principles are conceptualized as *semantic codes* that comprise *semantic gravity* and *semantic density*” (Maton 2020: 62). The enactment of Semantics dimension in researches across fields of practice arose from a dialogue with Systemic Functional Linguistics (SFL) especially on the notion of ‘grammatical metaphor’ and ‘technicality’. LCT Semantics is particularly relevant to the study.

3.1.1 Semantic Dimension

LCT Semantics is an analytical toolkit for understanding how meaning making takes place when knowledge is being mediated. It is a meaning making resource with two codes on the continuum at various degrees of strengths. The semantic dimension is framed within Bernstein's idea of horizontal knowledge and hierarchical knowledge structures (Maton, 2013:11). The idea is all about how meaning is made: abstract or less abstract. In other words, the purpose of the Semantics dimension is to give us a tool for understanding how meaning making takes place in the area of knowledge. The two codes with various degrees of continua are: a) semantic density (SD), and b) semantic gravity (SG).

3.1.1.1 Semantic codes

Semantic gravity (SG) refers to “the degree to which meaning relates to its context” (Maton, 2013:11). This means the level at which meaning is made explicit, clearer and transparent to the learners or in a text. Semantic gravity provides us with a framework for determining if knowledge items or meanings in teacher-talk are relatively more explicit (SG+) or relatively less explicit (SG-) to the learners. How explicit the meaning is relates to the content of the course or item. This means that someone has to have the initiative in order to understand the content of a specialized field that consists of abstract and technical terms.

On the other hand, *semantic density* (SD) is the extent to which meaning is loaded within “symbols, terms, concepts, expressions, gestures” (Maton, 2013:11). This code allows us to determine whether the meaning of a word or symbol is relatively more loaded or more compressed in a word (SD+), or if the meaning is relatively less compressed or less loaded in a word (SD-). Antia and Kamai (2016) explain both codes as follows:

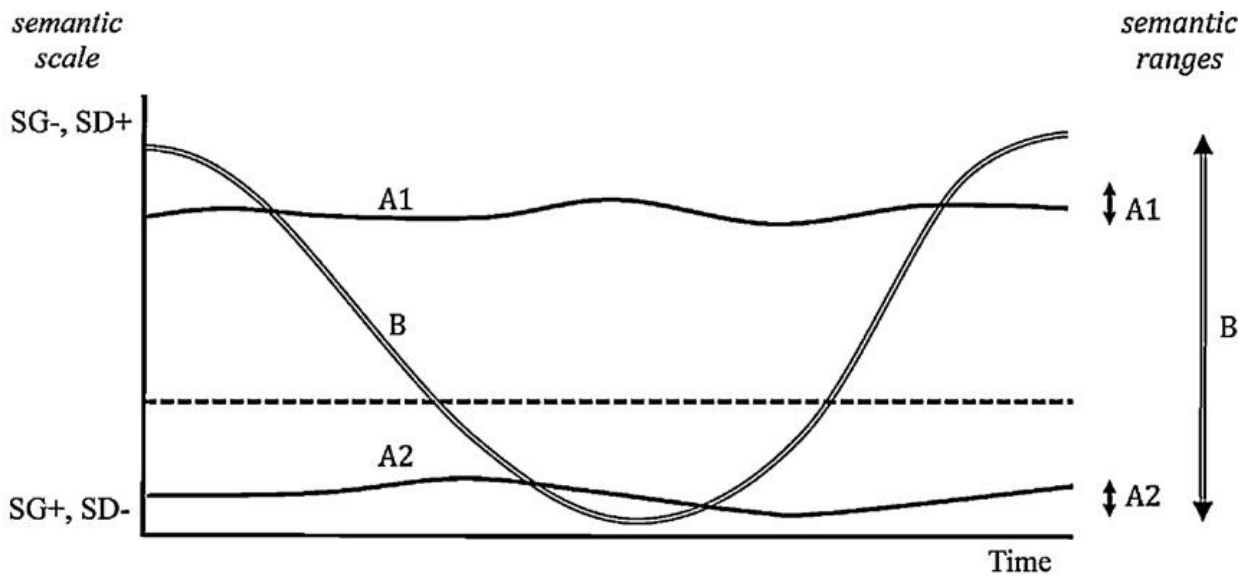
Given that all meanings are dependent on some kind of context, semantic gravity may be seen as referring to the degree to which meanings are heavily or not heavily dependent on specific kinds of context; in other words, ... the degree to which meanings communicated are more abstract or less abstract, more decontextualized or narrowly context-dependent. Thus, while the term ‘Sodium chloride’ and its symbol ‘NaCl’ do come with a context, that context is more general or abstract than the one for, say, ‘table salt’. So, ‘Sodium chloride’ may be coded ‘SG-’ (low semantic gravity) to indicate it is relatively less context-dependent, more generic, while ‘table salt’ might be coded ‘SG+’ (high semantic gravity) because the context of its meaning is more circumscribed.

Semantic density, on the other hand, refers to just how much knowledge goes into constituting a given meaning and, conversely, how much knowledge or effort is required to unpack that meaning. The concept underlying the term ‘Sodium Chloride’ would, in many situations and as evidenced by conventional definitions, require quite a bit of disciplinary knowledge to be unpacked, whereas comparatively much less information may be required to explain or understand ‘table salt’. In other words, there is greater condensation of meaning in the former than in the latter. On this reading, then, ‘Sodium Chloride’ would be coded SD+ to indicate a higher level of meaning condensation than ‘table salt’ which would be coded ‘SD-’ (Antia & Kamai, 2016: 204).

Both semantic gravity and semantic density trace a continuum of various degrees of strengths that can track the shifts of teacher-talk. For example, the symbol H₂O is not readily explicit so it is (SD+). It is abstract and therefore less dependent on the context, because there are layers of knowledge that need to be unwrapped in order to get to the root of H₂O. When we look at the term water, however, it is (SD-) because there are no layers to be unwrapped. Water is relatively more explicit compare to H₂O. As Hassan (2017:102) put it: “Weakening SD occurs when there is movement from highly condensed practice or symbol, to one that involves less meaning”.

The LCT Semantics can be visualized in the form of *semantic profiles* having different shifts with relative strengths of SG and SD over time or in text/talk time. Tracking the shifts in the use of both codes will enable us identify the profile that occur in a teacher talk or in a text of a writer. These codes offer us a fine-grained analysis of knowledge. This point is well supported in Maton (2013, 2014a, 2014b), Arbee (2014), and Blackie (2014).

Maton (2013) identifies the following profiles: semantic waves, high semantic flatlines, low semantic flatlines, downward shifts, and upward shifts. A simple graphic representation illustrating three different semantic profiles was offered by Maton (2013), as seen in Figure 3.1, depicting a scale of strengths on the y-axis, and time on the x-axis. The different kinds of profiles are represented as A1, A2 and B. For instance, Figure 3.1 traces a high *semantic flatline* (A1), a low *semantic flatline* (A2), and a *semantic wave* (B).



Key

SG = semantic gravity; SD = semantic density; + = stronger; - = weaker

Figure 3.1 Semantic profile revealing three different knowledge profiles (Maton 2013)

Figure 3.1 shows a *high semantic flatline*, which indicates that meaning making is taking place at a less explicit level, with a lot of technical information and terms that may be difficult to understand by non-specialists, as shown in (A1). The *low semantic flatline*, however, depicts where meaning is made at a more explicit level, and involves the use of examples and everyday language, as can be seen in A2. As a profile, *semantic waves* are the outcome of mediating knowledge through the process of ‘unpacking’ and ‘repacking’ knowledge (Maton, 2013:12; Matruggio *et al.*, 2013:45). For example, a teacher will have a high start by introducing SD+ concepts and move down to describe in a simple and concrete particularities using examples, before moving up towards more technical and condensed information. This movement could be repeated throughout the lesson, tracing a series of cumulative semantic waves (Maton, 2014).

The profile of *downward escalator/shifts* is formed when the teacher repeatedly unpacks technical terms in the process of teaching at intervals by giving examples in everyday language without modelling the process of shift back to the technical terms (Maton, 2013:14). Figure 3.2 provides an example adopted from Maton (2013):

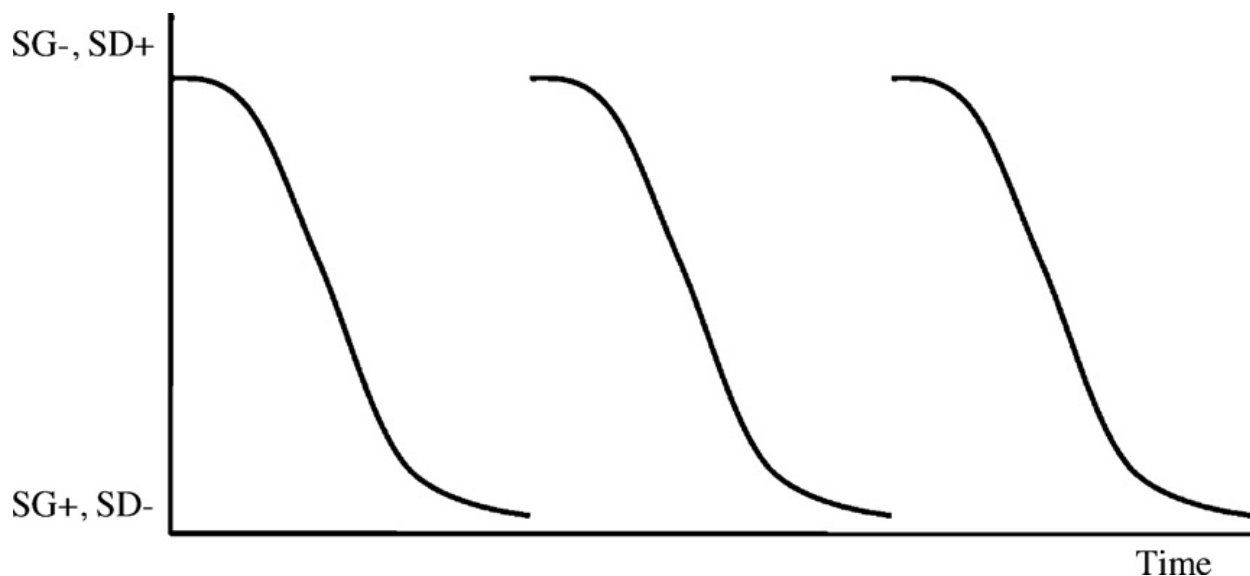


Figure 3.2 Semantic profile revealing downward escalator (Maton 2013)

Figure 3.2 shows downward semantic shifts with a movement from highly condensed and complex ideas (SD+) towards simpler, more concrete understandings, often including examples from everyday life, but hardly moves “back into the pedagogic discourse of the subject through ‘repacking’” (Matton, 2014: 14).

For this thesis, the codes of the Semantic Dimension, as well as the possible profiles, will provide us with the complementary and explanatory tools for understanding how knowledge is being mediated by teachers in classroom interactions over time. The application of these tools will not only allow us to observe differences in the lessons, both within and across disciplines (science and business lessons), but will also provide us with a basis for understanding and modelling multilingual language use in the flow of teacher-talk. It will equally allow us to determine how language-knowledge profiles shape the understanding of the learners arising from their demonstration of their knowledge.

3.1.2 Classroom studies using LCT Semantics

LCT semantic has been applied to teaching and learning in various fields of studies (Subethra & Vivienne, 2019; Hassan, 2017; Conana, Marshalla & Case, 2016; Blackie, 2014; Mcnaught, Maton, Martin & Matruglio, 2013; Matruglio, Maton & Martin, 2013; Martin, 2013). For instance, Conana, Marshalla and Case (2016) used LCT tools to examine pedagogical practices and student learning in two undergraduate Physics courses at the University of the Western Cape in South Africa focusing on problem-solving. They derived

data from three sources: video recordings of lectures, students working on problem tasks, and interviews with students. Reporting on the efficacy of LCT, the authors claim that the semantic profiles of the extracts obtained from the video recordings of lectures and students' interviews "indicate that when the pedagogy was aimed at making explicit to students the discourse features and representations entailed in problem solving, led to students' greater 'disciplinary fluency'" (Conana, Marshalla & Case, 2016: 40).

In a bid to enhance students' understanding of abstract oral health concepts, Subethra and Vivienne (2019) corroborated Conana, Marshalla and Case's (2016) study, when they investigated tutors' use of semantic waves as a teaching strategy to guide students' learning in a three-year degree programme, a Bachelors of Oral Health (BOH), at the University of the Western Cape. Subethra and Vivienne's (2019) findings revealed that "using components of the semantic waves did assist students with their understanding of difficult concepts". Their results indicate that tutors moved down the semantic wave, linking the abstract content items to everyday language and lived experience. Equally, Hassan (2017) undertook an empirical interrogation of tutors' roles in the 'unpacking' and 'repacking' of information in tutorial classes in seven faculties in various disciplines across departments at the Cape Peninsula University of Technology, Cape Town in South Africa. Two methods of data collection were used: qualitative and quantitative. For the qualitative data collection, there was a face-to-face interview with six tutors and seven lecturers who were purposefully selected. Questionnaires were also administered to 896 tutees. A digital voice recorder and hand-written notes were employed for collecting qualitative data. In terms of the quantitative data collection, the author used structured items using a five-point Likert scale. Hassan (2017: 101) revealed that using the semantics dimension, tutors were able "to move knowledge from concrete real life situations towards abstract theorization ('repacking')".

Clarence (2016) explored the nature of disciplinary teaching and learning using the LCT Semantics dimension in a Political Science course at the University of the Western Cape by engaging in a theory-led conversation. He obtained data from two separate workshops with educators who were teaching in the Political Science department at the University of the Western Cape. The data was sourced through audio recordings of these two workshops. Clarence (2016: 135) noticed that "LCT tools offered by the dimension of Semantics have opened up a generative space for new kinds of conversations about teaching and also curriculum design".

Blackie (2014) sought to illustrate the use of the semantic code of Legitimation Code Theory in chemistry teaching in South Africa. Aspect of her data come from chemistry vocabulary and symbols, specifically the chemical equation $\text{NaCl(s)} \rightarrow \text{NaCl(aq)}$, and the application of a Grignard reagent in a second year undergraduate course. Blackie (2014) revealed that using the semantic wave changed the way she teaches to a certain extent, and that she intentionally moves between the higher and lower semantic density, and weaker and stronger semantic gravity. As Maton and Chen (2020:36) summarised, “LCT concepts bring knowledge practices into view and enable their forms to be analyzed in relation to students’ dispositions”.

Arising from the above, we observe that the literature presented focussed on using LCT tools to analyze monolingual discourses in higher education, but our work focuses on multilingual teacher talk in secondary schooling.

3.2 Terminology Theory

An important feature of the study of terminology is concerned with the way in which units of knowledge or concepts are represented (Antia, 2000, 2015; Sager, 1990; Galinski and Picht, 1997; Bruno de Besse, 1997; Wright, 2001). Conceptual knowledge in a classroom lesson may be represented in a number of ways. Addressing these several ways enables me to distinguish the different encodings of knowledge in teacher-talk, and (where appropriate) to also employ these encodings as a means for analysing multiple language use in teacher-talk. There are five ways in which units of knowledge can be represented using terminology theory (TT), namely: terms, symbols, examples, definitions, and explanations.

3.2.1 Terms

Term is one means of representing knowledge (Antia, 2000). A term is defined as “[a] verbal designation of a general concept in a specific subject field” (Antia, 2000: xv). It may be a one-word term (e.g. ‘wave’), or multi-word term (e.g. ‘four-wheel-drive vehicle’). Concepts which are represented by terms are the foundation of specialised knowledge in texts or lessons of history, medicine, linguistics, chemistry, sociology, and so on.

3.2.2 Symbols

In terminology studies, symbols are another means of representing knowledge. Since terms are considered verbal descriptions of concepts, symbols are viewed as non-verbal descriptions of concepts. According to ISO 704 (2009), graphics / images are a means of representing concepts. For example, in streets and highways, a graphic representation for ‘hospital’ would be an image of a bed with red cross to communicate that patients are admitted in the building:

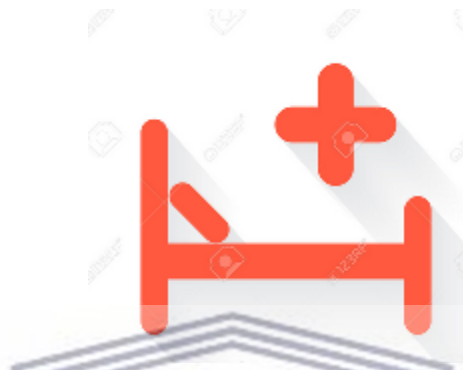


Figure 3.3 A symbol of a hospital.

Letters, numbers, as well as chemical formulae are symbols, according to ISO 704 (2009). For example, the symbol for the American dollar is \$, and the symbol for copyright is ©.

3.2.3 Definitions

Definitions are also considered as another form of representing knowledge. According to Sager (1990:39), “the definition is a linguistics description of a concept, based on the listing of a number of characteristics, which conveys the meaning of the concept”. In terminology, different types of norms (i.e. purpose, method) are employed to proffer various types of definitions, namely, terminological, intentional, lexicographic, encyclopedic, and extensional, among others. In the current context, the lexicographic definition is of interest. Lexicographic definitions are “explanations of words or terms” and may be seen as “morpho-semantic definitions, which consist of semantically equivalent structures or paraphrases” (de Besse, 1997: 69). An example is *intracranial haemorrhage* as *bleeding inside the skull* (Antia, Budin, Picht, Rogers, Schmitz, & Wright, 2005). To understand the sense in which a lexicographic definition can represent a concept, consider a Grade five student saying: “the specialist physician who cuts people open”. Without using the term ‘surgeon’ the student has

been able to use a lexicographical definition to represent the professional in question. What this means is that a lesson or a text on a content subject may describe and convey a specialised concept through a definition alone or along with the corresponding term/s.

3.2.4 Examples

Examples may also be used to represent and communicate knowledge. According to ISO 1087-1 (2000), the extension of a concept refers to all the objects that correspond to a concept, and an extensional definition describes a concept by itemizing its subordinates from one specific perspective. Cabre (1998: 99) notes that describing a concept extensionally means “listing all of its possible realizations”. Obviously, enumerating all the subordinate concepts does not really mean explaining directly. Conversely, it is possible that this itemizing promotes and encourages the development of a mental image of the concept. For example, one may use Samsung Galaxy, i-Phone, Nokia and so on to facilitate an understanding of cell phones.

3.2.5 Explanations

Another method that can be used to represent knowledge are explanations. According to Antia and Ivo (2013), encyclopaedic definitions provide general (background) information, and go beyond just explaining a word (lexicographical definition) and situating a concept within a knowledge structure (terminological definition). Commenting on encyclopedic definitions, de Bessé (1997: 64) proposed that there are instances in which a “lexicographic definition is followed by statements of knowledge and explanations that can be clearly identified as encyclopaedic”. To represent a concept encyclopaedically is to draw attention to a wide scope of features of the concept. It is to represent the concept through explanation with the clear intension of enhancing understanding.

In spoken language, it is possible to consider ‘evocation’ as a mode of describing / recalling knowledge. At the beginning of a new classroom lesson, it is normal for the teacher to review the previous day’s work. Learners are re-assessed to recall materials they learned in the last lesson, and this information may provide the premise for the new lesson. This confirms with the principles of intertextuality as building new knowledge on existing or previous knowledge. As a means of knowledge representation, knowledge can be represented

through evoking to call to mind existing information in order to form a premise of understanding on which new knowledge will be formed.

In this thesis, analysing the transcripts of teacher-talk using these sets or types of knowledge units will equally allow us to track what language tends to be used for what knowledge types. In addition, these categories will also be useful in the context of using LCT semantics to analyze the lessons.

3.3 Summary of the Chapter

In this chapter, we have addressed two major theories on which this research is built – Legitimation Code Theory (LCT) and Terminology Theory (TT). LCT is a sociological theory that views knowledge as under-explored and under-theorized in empirical research. It allows us to address obscurity in education and beyond. The theory allows us to have a detailed assessment of classroom talks as well as text analysis. From the five dimensions of LCT, our study adopted the Semantic Dimension which is a toolkit for understanding how meaning making takes place in the area of knowledge. The two codes of Semantic Dimension, semantic gravity (SG) and semantic density (SD), provide researchers with the opportunity to determine if knowledge of items or text is relatively more explicit or relatively less explicit.

Terminology Theory (TT) is also associated with a social approach to analysing units of knowledge in classroom talk and other discourses. It addresses conceptual knowledge in the classrooms in a number of ways, especially by identifying different encodings of knowledge in multilingual teacher talk. We highlighted five means of illustrating knowledge, as identified by Antia, Sager, and Wright. LCT and TT are similar in the sense that LCT analyzes knowledge through the use of both horizontal discourses and vertical discourses, and Terminology Theory takes it further by identifying the units of knowledge.

CHAPTER 4: Research Methodology

4 Introduction

For the purpose of analyzing this study, we adopted a combination of qualitative and quantitative methods. A qualitative research method is the process of “making a real-life inquiry that seeks detailed understanding of social phenomena within their natural setting” (Williams, 2007:67). In other words, it investigates the social phenomenon from the participants’ viewpoint. The qualitative method contains data from a transcript of recorded teaching or recorded speech, test administered, questionnaire, image data, and so on. Creswell (2009:176) pointed out that qualitative research “attempts to produce rich, real, and valid data from a rational standpoint”. It provides detailed evidence reported in the “voices of participants and contextualized in the settings in which they provide experiences and the meanings of their experiences” (Creswell & Garrett, 2008:322). In terms of research validity, Creswell and Miller (2000:125) explained that validity in qualitative research is “used for accuracy in the sense that how accurate the findings are from the perspective of the participants, researcher and readers”. Therefore, if the findings of the study satisfy all the three key participants of the study, then “the study is said to have solid validity” (Creswell and Miller 2000:125). In order to address the key objectives of this study, as outlined in Chapter 1, a qualitative approach is necessary to gain rich and in-depth data.

On the other hand, a quantitative research method involves a survey and experimental design as well as data from empirical observations (Creswell, 2009:145). A quantitative method involves the collection of statistical data which uses numbers as practical evidence to make a decision or to interpret numerical results from a particular phenomenon. As Creswell and Garrett (2008:322) put forward, quantitative research has conventionally “provided a measurement orientation in which data can be gathered from many individuals and trends assessed across large geographic regions”. Our study uses a quantitative method because we need numerical data to answer or address the key objectives of this study.

By bringing together both quantitative and qualitative research, “the strengths of both approaches are combined, leading, it can be assumed, to a better understanding of research problems than either approach alone” (Creswell & Garrett, 2008:322). This is referred to as a ‘mixed methods’ approach. Creswell (2014:4) defines a mixed methods research design as

one which “incorporates elements of both qualitative and quantitative approaches....to provide a more complete understanding of a problem”. In other words, a mixed methods research design merges and integrates both qualitative and quantitative approaches to easily solve research problems, referred to as “the third movement” (Creswell & Garrett, 2008:322).

The qualitative data used for this thesis will comprise of transcripts of multilingual teacher-talk in several lessons as well as follow-up interviews with teachers, whilst the quantitative data will be derived from the performance scores of learners in a written assessment that is aimed at determining the impact of multilingual teacher-talk.

4.1 Data Source

The study was conducted in four secondary schools in Yola, North-Eastern Nigeria. The schools include two well-resourced (private) schools, namely, Concordia College Yola, and Yola Model Secondary School, and two under-resourced (public) schools, namely, Government Girl’s Secondary School, Yola, and Aliyu Musdafa College Yola. In the analysis, the names of these schools are not used. Instead, letters of the alphabet are used. The criterion for selecting these schools was similar to comparable studies conducted by Cobbold (2015) and Dronkers and Robert (2003), where schools used for their studies were identified based on their socio-economic status. For instance, Cobbold (2015) reviewed the academic performance of private versus public schools in Australia. In comparing the outcomes between private schools and public schools, one of the key findings identified by Cobbold (2015) showed higher achievement in the private schools compared to the public schools, because, according to him, the vast proportion of the disadvantaged students attended the public schools.

The four schools are situated in the twin cities of Jimeta and Yola (administratively, all establishments and/or institutions located within the two cities are referred to be in Yola).

School A is believed to be one of the best private schools in Yola, Adamawa State. It is located in Karewa Government Reserve Area (GRA) where the top government officials in Adamawa reside. The school is situated in the administrative city of Jimeta. The school is open to learners from all socio-economic backgrounds. However, as a result of the presence of highly qualified teachers and the high school fees, only learners from high socio-economic backgrounds attend Concordia College, Yola. In other words, most learners at this school

come from wealthy homes. The official language of teaching and learning in the school is English.

School B is a girls' school, referred to as Government Girls' Secondary School, Yola. It is a public school and situated in Jimeta, opposite the Adamawa State Government House, the residence of the State Governor. It is regarded as one of the best public secondary schools in Adamawa State. The school has also been given the position of 'pilot school' which means the State Government pays more attention to the school in terms of teaching and learning, resources, category of teachers, and the welfare of the learners compared to the non-pilot schools. Most of the learners come from middle income families and almost all of them speak Hausa as their home language, with Fulfulde or English as a second language. The official language of teaching and learning in Government Girls' Secondary School, Yola is also English.

School C and School D are situated in Yola-Town, the historic bastion of the seat of the Lamidó Fombina, Adamawa Emirate Council. The city also serves as the cultural citadel of the Fulbe dynasty.

School C is located in the predominantly low socio-economic area of Yola. The majority of the learners in this school have Fulfulde as their home language. The learners in this school are mostly from small or low income homes. The official classroom language at School C is English only. There are also other learners who come from other neighbouring states who are not home language users of Fulfulde, but have Hausa as their home language.

School D is located in a predominantly civil servant settlement in the Government Residential Area (GRA) of Yola-Town, popularly referred to Shagari Housing Estate. The majority of learners come from middle income families. Though the majority of the learners have English as home language, Fulfulde and Hausa play major roles in their linguistic interactions. The school attracts learners from neighbouring settlements such as Wuro Hausa and Technical College (TC) Staff Quarters.

4.2 Data size and sampling

There were 12 teachers who participated in the research (eight science teachers and four business studies teachers). In each case, half of them were from the two categories of schools i.e. six teachers from the private schools, and six teachers from the public schools. Teachers who were selected for the study were specialists in their fields (science and business studies)

who teach at the junior secondary school level. In addition, the teachers have a diverse linguistic repertoire.

A total of 240 student participants were also recruited for the study: 120 students in JSS1 (Grade 7), and 120 students in JSS3 (Grade 9). In the analysis, schools were identified according to the letters of the alphabet: School A, School B, School C, and School D. We identified teachers in the transcripts by pseudo-names, while students were represented as ‘student’ for single students or ‘students’ for chorusing and multiple simultaneous answers during class interactions.

Table 4.1 below presents the teacher participants, number of students, disciplines and topics across schools.

School categories	Teachers (not real names)	Grade levels	Disciplines	Topics	Numbers of students
School A (private)	Mrs. Sarah Diwa	JSS3 (Grade 9)	Science	Compound elements	20
	Mr. Silas Ganwari	JSS1 (Grade 7)	Science	Immunization	20
	Blessing Chima Okoro	JSS3 (Grade 9)	Business studies	Trading, profit and loss account	20
School B (public)	Mrs. Sakina Mahmud	JSS3 (Grade 9)	Science	Ozone layer	20
	Mrs. Julie Julius	JSS1 (Grade 7)	Science	Water borne diseases	20
	Miss Christiana Istifanus	JSS3 (Grade 9)	Business studies	Bank reconciliation statement	20
School C (public)	Mr. Pwajenti Hamidu	JSS3 (Grade 9)	Science	Light energy	20
	Mr. Usman Abubakar Adamu	JSS1 (Grade 7)	Science	Characteristics of living things	20
	Mr. Samuel Jacobs	JSS1 (Grade 7)	Business studies	Occupation	20
School D (private)	Mr. Bulus Dauda	JSS3 (Grade 9)	Science	Drug abuse	20

	Miss Rachael Henry	JSS3 (Grade 7)	Science	Solar system	20
	Mr. Haruna Segiru	JSS1 (Grade 7)	Business studies	Forms of business	20
4 schools	12 teachers	12 classes	12 lessons	12 topics	240 students

Table 4.1 Distributions of the overall participating schools and teachers(all names are pseudonyms)*

Table 4.1 represents the teachers who participated in this study. With regard to the general linguistic profile of the participating teachers, 11 of the teachers are indigenes of Adamawa state, North-East, Nigeria, and residents of the twin cities of Jimeta and Yola at the time of data collection. The teachers can speak both Hausa and Fulfulde in addition to English, the official classroom language, while one teacher comes from the southeastern part of Nigeria and speaks Hausa and English.

4.3 Data Collection Method

Permission to gather data for the study was obtained from each principal of the four schools (see appendix B). As administrative officers of various schools, each school principal appointed the volunteering teachers, who were specialists in the fields of science and business studies.

We then informed teachers that the visits to their classes were solely for research purposes. Neither the teachers nor the learners were informed that the study would focus precisely on the multilingual language practices in their interactions in the class.

4.4 Instruments for Data Collection

Two instruments were used to collect the data. For the classroom teacher-talk, a digital audio tape recorder was used to audio-record all the proceedings of multilingual classroom teacher-talk in JSS1 (Grade 7) and JSS3 (Grade 9) lessons in science and business studies. At each grade level and in each school, two successive lessons in a given subject as taught by the teachers were recorded. A total of 24 lessons were recorded.

The instrument for collecting the second data, which was on the performance of learners in a test, was an evaluative task administered to 20 students in each class at the end of each

lesson. It was a five-item test of material taught by the respective teachers. The items were developed by the teachers on the basis of a previous analysis of the transcripts which will show, for example, areas where the same concept is expressed in different languages or encoded in different strengths of, for example, semantics density. The questions were prepared and marked by teachers who taught the lesson, and scores were awarded.

4.5 Data Processing (Transcription, Translation of Glossaries)

All the lesson transcripts of our data on multilingual teacher-talk were transcribed using Cameron's (2010) transcription conventions. There is a need to be cautious when transcribing, so as to "avoid editing out typical speech features like repetition, pause and whisper" (Cameron, 2010: 36). Repetition in teacher-talk plays a vital role in analysis. Sometimes the teacher:

wants to buy time, to plan the next chunk – which is useful to the hearer who has to process the utterances in real time. Certain amount of pausing and repetition increases the hearer's chance to comprehend the talk before it disappears (Cameron, 2010:33)

As the study focuses on the use of multiple languages (English, Hausa and Fulfulde) in classroom teaching and learning, we used normal English spelling rules for English terms. Also, as the official language of the classroom in junior high schools in Nigeria is English, all utterances in Hausa or in Fulfulde were translated into English. We used *italics* in the English translation of the learners' home languages. Where a term or a phrase required an encoding of knowledge, we highlighted, underlined and use italics for easy identification. Although teachers' multilingual talk was the focus of the study, all noticeable classroom talk such as student talk was transcribed since it is an important part of the context.

4.6 Data Reliability for home languages

In order to have accurate and consistent translations, an inter-rater reliability check was performed on all the multilingual transcripts. Two individuals in Nigeria with expertise in linguistics were consulted on the translation involved: one for Fulfulde, and the second for Hausa. They were then given samples from the translated transcripts. The translation of Fulfulde utterances was vetted by a PhD candidate of Fulfulde linguistics at the University of

Maiduguri, Nigeria, who is also a lecturer in the Department of Fulfulde, Federal College of Education, Yola. For Hausa utterances, the translations were checked by a PhD candidate in Hausa language, Bayero University Kano, Nigeria, and a lecturer in the Hausa Department, Federal College of Education, Yola. Agreement among the researcher and the other two individuals was high and disagreements were reconciled.

4.7 Coding for terminology

Coding was used to classify the categories of our data. The most prevalent categories of our data are ‘terms’ and ‘clauses’. The focus is on terms and clauses, because the way in which the concept is presented can sometimes be in the form of another term or using a clause structure, as indicated in Figure 4.1 below.

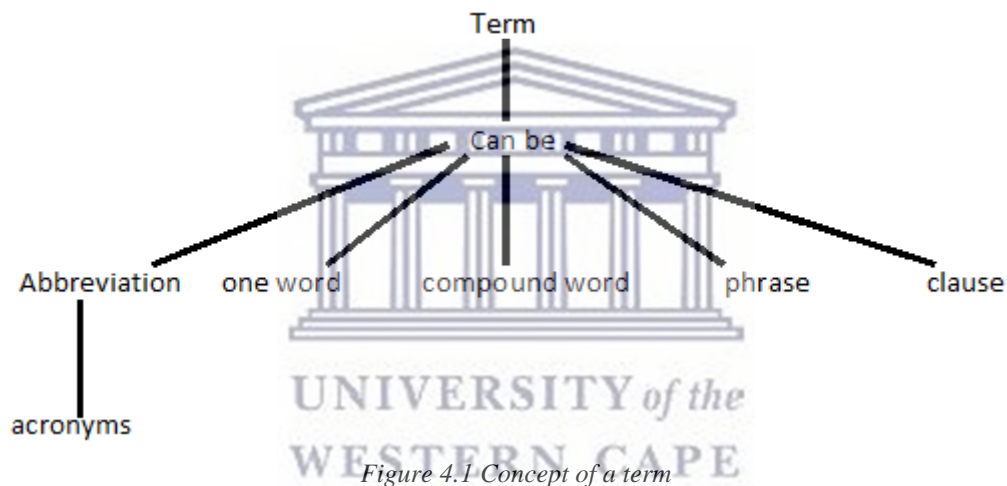


Figure 4.1 Concept of a term

Figure 4.1 shows that a term can be an abbreviation or an acronym; it can also be one word or compound words, a phrase or a clause. As a clause, it could be a definition, an elaboration, an explanation or the development of an idea. It can also function as an example (example can be one word, compound words, or in the form of a phrase or clause). In terms of unpacking, Figure 4.2 below describes the process:

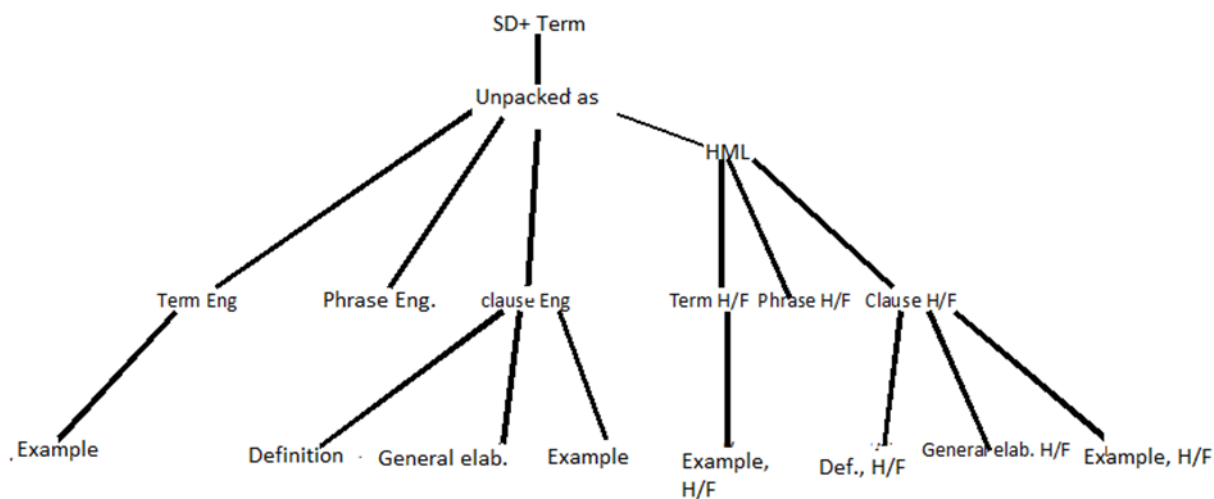


Figure 4.2: Term and its unpacking (Eng. = English, H= Hausa, F= Fulfulde, elab. = Elaboration, def. = definition)

Figure 4.2 shows that a term can be unpacked or even repacked in a variety of ways. It can be unpacked with another term in the same language or as an original term in a different language (home language, Hausa / Fulfulde). A term can also be unpacked as a phrase in English or a home language, or as an example in English or a home language. A term can further be unpacked as a clause. A clause can be any definition in English or a home language, an elaboration in English or a home language, or an example in English or a home language.



4.8 Coding reliability for terminology

Having coded each transcript using categories derived from terminology theory, my supervisor went over it. There was a high level of agreement and the small number of disagreements was reconciled.

4.9 Coding Conventions for LCT

With respect to semantic density, we coded the transcript of teacher-talk for SD+ and SD-. Coding was done on the basis of two perspectives. In a discourse analytical perspective (largely the teacher's), theme-rheme relations in teacher-talk were determined. Relevant probes here included what the teacher framed as theme and the teacher's reformulations. Reformulation is a psychological act in which a speaker or text producer re-expresses through a form Z (which would often be SD-) a unit of knowledge X that had previously been

expressed through a form Y (which would often be SD+). Z could take the form of any of a synonym, definition, instance, example, explanation, etc. (Chukwu and Thoiron 1989, Martinot 2015). In the example below:

The causes of depletion of ozone layer (SD+) could be found in the release of gases (SD-) known as Chlorofluorocarbons (SD+)

the science teacher positions ‘depletion of ozone layer’ thematically, and it is coded as SD+. The rhematic account makes use of two further terms, with the more generic ‘gases’ (SD-) being reformulated into a more specific and dense ‘chlorofluorocarbons’ (SD+).

A second coding perspective, more subjective, was based on world knowledge inference. Underpinning this perspective was the question of what a student group in a given environment might reasonably be expected to understand/not to understand by close watchers of that environment (Cozijn Noordman & Vonk 2011, Singer & Ritchot 1996).

In the transcript excerpt below:

If we say occupation (SD+), we mean the work (SD-) which people do to earn a living (SD-), whether the work (SD-) is temporary (SD-) or permanent (SD-)

the business teacher constructs ‘occupation’ as the theme of the utterance, which world knowledge inference also suggests can reasonably be coded SD+; the teacher then says something about or explains this theme, making use of words coded SD- on the basis of world knowledge.

The coding was reviewed by my supervisor and agreement was high and disagreements discussed and reconciled. The researcher’s enumeration of content repetition as well as language identification was also confirmed by the verifying coder.

To make it easier to follow the description of the methods used in the study, Figure 4.1 is offered as a summary. The figure shows that we are using notions from two theoretical frameworks in the analysis, namely, Semantic density codes from Legitimation Code Theory and knowledge and units from Terminology Theory, that is, terms and clauses describing these terms

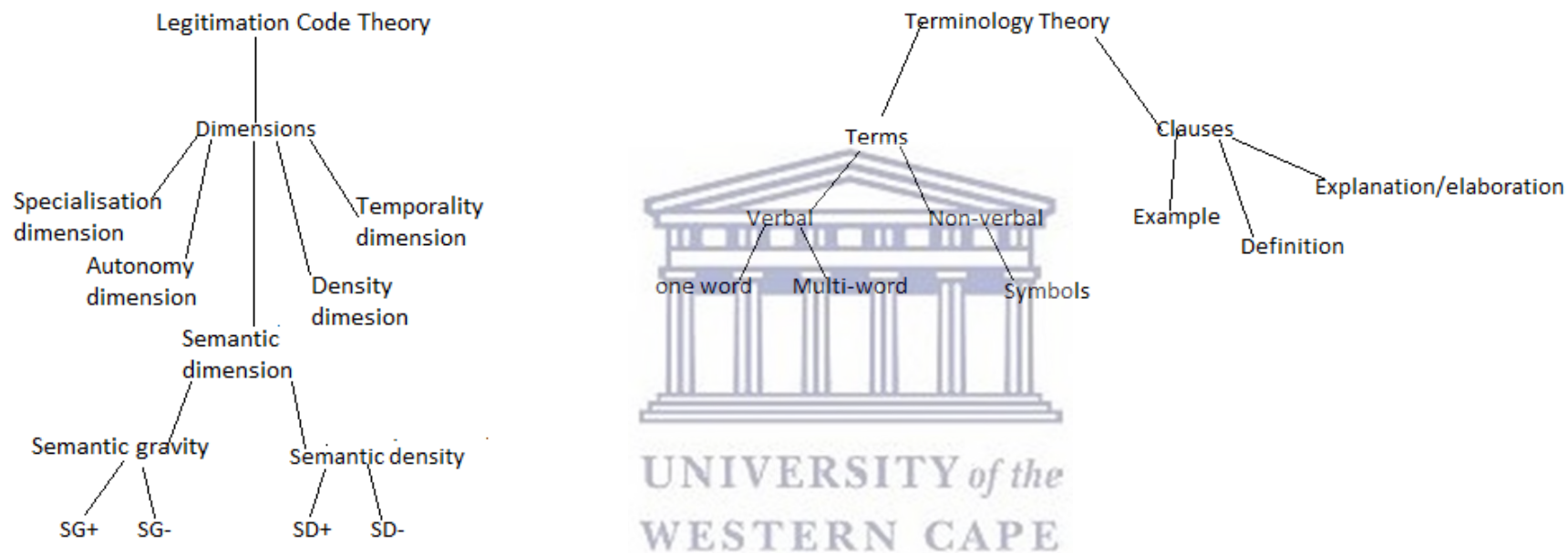


Figure 4.3 Description of two theoretical models for the study

In addition, Table 4.2 provides an overview of the stages and data sources involved in the method adopted.


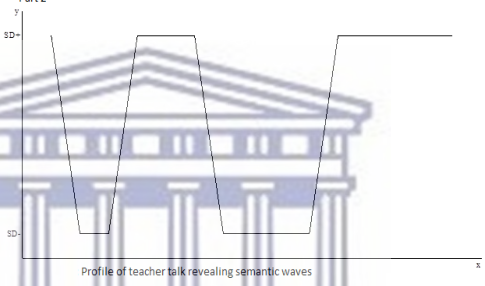
Teacher talking	Transcript	Coding of transcript	Combined language-knowledge profiles	Assessment/test with tasks linked to different language knowledge profiles plus repetition	Determinant of performance
	<p>Teacher: If we want to say drug abuse (SD+) what do we say in Hausa? Hmm? Teacher: <i>Shine amfani da magani ta hanyan da bai kamata ba</i> (SD-) (Hausa for: That is taking drugs in the way it is not supposed)</p>	<p>SD+/SD-? Language Repetition?</p>	<p>Transcript 1, JSS3 (Grade 9), Private school Science lesson Topic: Drug abuse Part 2</p>  <p>Profile of teacher talk revealing semantic waves</p>	<p>0%? 20%? 50% 80%? 100%?</p>	<p>Language? Knowledge structure? Repetition?</p>

Table 4.2 Stages of data sources and methodology

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4.10 Data Analysis

Recall that this study focuses on teacher-talk rather than student talk. The reason for focusing on teachers was that “teachers tend to speak more in class, even in more student-centered classes” (Seindelz, 2003:44). After coding our data, we categorized it according to each research question, as the analysis was done based on the objectives or research questions.

To be able to successfully treat all the research questions, we adopted the alternative hypothesis (H_1), focusing on the non-directional hypothesis (Mougouran & Sethuraman, 2017; Kalaian & Kasim, 2011). Adopting the alternative hypothesis (H_1) is appropriate because we do not know the “definite direction of the expected findings” (Mougouran & Sethuraman, 2017: 35).

To answer research question one of the study on the claim that there is a functional allocation of languages (FAL) in multilingual teacher-talk (in which language ‘x’ is used for so-called presentational knowledge and language ‘y’ for explanatory knowledge), we drew insight from the translanguaging model (Garcia, 2009; Lewis, Jones & Baker, 2012; Garcia & Orthuguy, 2019), and terminology theory (Antia, 2000) to guide us in analyzing the marked-up transcripts to find out to what extent this claim can be substantiated. To guide the direction of the answer, two hypotheses were developed:

If FAL is correct,

- i) The language of terms occurring in the presentational clauses would be only / mainly in the official classroom language, and the language of terms occurring in the explanatory clauses would be only / mainly in the non-official classroom languages.
- ii) In terms of clauses, English should be the dominant or the only language for presentational clauses, and Hausa and Fulfulde should be the dominant or the only language for explanatory clauses.

In addressing research question two on the encodings of knowledge occurring in a set of science and business studies lessons, we drew on Maton’s (2013) LCT semantic density to identify the encodings of knowledge ($SD+$ and $SD-s$) in the overall lesson transcripts. We also categorized the encoding of knowledge within and across grade levels and within and across school types. An alternative hypothesis was formulated, thus:

If FAL is correct,

- i) we expect that the high semantic density (SD+) terms should only / mainly be in the official language, which is also the language in which we expect to find the presentational clauses, and the low semantic density (SD-) terms should occur only / mainly in the non-official classroom language which is the language of the explanatory clauses.

To respond to research question three on the types of knowledge profiles in teacher-talk and how language use fits into the observed profiles, we used two approaches to be able to successfully address this objective. Drawing on LCT Semantics (Maton, 2013), we first identified the modelled knowledge units across the transcripts using semantic profiles, while also seeking to identify which of the several semantic profiles emerged from each transcript. Second, we drew insight from Reh's (2004) model of multilingual writing from linguistic landscapes to analyze the second part of research question three on how language use maps onto the profiles. Reh proposes four parameters that can easily assist inter- and intra-lingual communication in multilingual spaces: "duplicating multilingualism, complementary multilingualism, fragmentary multilingualism and overlapping multilingualism" (Reh 2004:8). According to Reh (2004:8), duplicating multilingualism refers to situations where "the same information (or a text) is presented in more than one language". This could be in the form of translation, reformulation, or restating of the information in another language or languages. Complementary multilingualism refers to situations where "different parts of the information are each rendered in a different languages" (Reh, 2004:15). This means that, to be able to comprehend the entire information presented, one has to understand both languages. Fragmentary multilingualism, according to Reh (2004:10), refers to a "situation where the overall message is presented in only one language, but some selected parts are translated into an additional language(s)". This allows the speaker (in this case, the teacher) to emphasis on main items in the message. The fourth principle refers to "overlapping multilingualism" which is "two different types of texts are presented; one text offers additional and/or similar information to another text" (Reh, 2004: 12). With overlapping multilingualism, monolingual speakers can gain knowledge of only one text while multilingual speakers get additional information from the two texts (Reh, 2004). For the purpose of our analysis, and because we are using three languages, we adopted the terms 'bilingualism' and 'trilingualism' for the four models. Thus, we have a) duplicating bilingual

and duplicating trilingual; b) complementary bilingual and complementary trilingual; c) fragmentary bilingual and fragmentary trilingual; and d) overlapping bilingual and overlapping trilingual. We developed three alternative hypotheses:

- i) Science should have more high semantic flatlines and semantic waves, and Business should have more low semantic flatlines and semantic waves
- ii) JSS1 (Grade 7) should have more low semantic flatlines and semantic waves, and JSS3 (Grade 9) should have more high semantic flatlines and semantic waves
- iii) private schools should have more high semantic flatlines and semantic waves, and public schools should have low semantic flatlines and semantic waves.

To analyze research question four on whether there are differences in the composite knowledge-language profiles observed, we analyzed the data in conjunction with research question three. In order to have optimal analysis of this objective (or research question), we developed the idea of “canonical patterns” from the transformational generative grammar using kernel sentences (Chomsky, 1957). A kernel sentence is a simple declarative structure comprised of a single verb, which is also known as the basic sentence (Matthews, 1981). In other words, it is a simple, active and declarative sentence containing one idea. Matthews (1981) added that the kernel sentence is the simplest form of a sentence which conveys only one idea. The distribution of canonical and less canonical phenomena can be scrutinized in terms of its rate of appearance in the texts (Evans, 2003: 9). Moreover, the premium sentences indicate that the sentence on the surface is the transformation of the kernel sentences. Chomsky (1957: 92) maintains that “every sentence of a language will belong to the kernel or will be derived from the string underlying one or more kernel sentences by a sequence of one or more transformations”. Chomsky further affirms that, in order to understand a sentence, it is necessary to know the kernel sentence from which it originates. Within this model, “the construction of any other sentence or sentences that contains clause will be reduced to that of kernel sentences wherever it is attainable” (Chomsky, 1957: 92). Our canonical pattern has also been developed by borrowing and modifying some of the ideas of the adjacency pairs or “the utterance pair” (Schegloff & Sacks, 1973: 73). These interlinked pairs comprise of a sequence consisting of two utterances with “adjacent positioning of component of utterances and different speakers producing each utterance” (Schegloff & Sacks, 1973:74).

What we have decided to do in order to answer this question was to develop possible two units of canonical patterns having English and two home languages (Hausa and Fulfulde) as input to find out how using these lenses, LCT semantic can assist in answering the question.

We identified two unit patterns of progression in the text. Using R software as input, permutation was done to generate possibilities.

The Formula for permutation is: $= npr$

= n = vector of elements (e.g. SDEng+, SDEng- etc.)

= p = permutation function

= r = target vector on Two units and repeats

We were statistically able to discover that with two units we could generate 36 possible patterns of permutations, examples, SDEng+, SDEng-, SDEng+, SDHmL1-, SDEng+, and SDHmL2+.

We then investigated the differences in certain variables such as the general patterns of multilingual knowledge profiles across subject types (science versus business studies), differences in the patterns of multilingual knowledge profiles across grade levels (JSS1 [Grade 7] versus JSS3 [Grade 9]), and differences in the patterns of multilingual knowledge profiles across school types (private schools versus public schools). We formulated three hypotheses, as:

- i) Business lessons will have a more multilingual knowledge profile than the science lessons.
- ii) We expect more multilingual knowledge profiles in JSS1 (Grade 7) than in JSS3 (Grade 9).
- iii) Multilingual knowledge profiles will be more dominant in the public schools than in the private schools.

In addressing research question five of the study, on the effects of various language-knowledge profiles on students' understanding of the lesson, the results of the test administered to the learners were analyzed. We grouped the knowledge-language profiles into two categories: i) language profiles involving (on the knowledge side) low semantic density, and ii) language profiles involving (on the knowledge side) high semantic density. We developed two questions:

- i. What composite knowledge-language profiles appear to best explain learners' performance to a question in business lessons at JSS1 (Grade 7) versus JSS3 (Grade 9), and across private schools and public schools?
- ii. What composite knowledge-language profiles appear to best explain learners' performance to a question in science lessons at JSS1 (Grade 7) and JSS3 (Grade 9), and across private schools and public schools?

Using the idea of “the measures of centre of tendency” (mean) and “measures of variability” (range) of our data (Sykes, Gani & Vally, 2016: 276-277), we fixed the stellar performance of the students into a) 60% to 100%, the students performed very well, and b) 0.0% to 59%, the students did not perform very well.

Both the mean and the range allowed us to calculate students' scores of a) numbers of answers repeated in a given question; b) calculate the performance of students in relation to language profiles connected to answers, and c) calculate the performance of students associated with answers connected to different languages. The mean and the range had further enabled us to compare the differences in two sets of scores each in science versus business, JSS1 (Grade 7) versus JSS3 (Grade 9), and private schools versus public schools.

4.11 Ethical Statement

This study on multilingual classroom teacher-talk deals with teachers and students, so there was a need to obtain permission from the authority of the schools I intended to visit for my data (see Appendix B). This is because dealing with teachers and students is a very sensitive thing in the education sector. I first sought and obtained ethical approval from the authorities of the University of the Western Cape (UWC) through the Senate Higher Degrees Committee, which granted me permission to proceed with the data collection (see Appendix A). The letter from UWC provided me with the opportunity to discuss my research with the administrators of the selected schools, the teachers, and the students on the guidelines for the research.

Having obtained ethical clearance from the University of the Western Cape (UWC), South Africa, I proceeded to Yola, North-East Nigeria. I followed due process to obtain free access to the selected schools of my choice. In order to avoid harm either to the school authorities or to the individual participants (teachers and students), I followed all the required steps to

ensure that the protection and safety of the participants' identities were guaranteed. I visited the principals (school administrators) of the participating schools to inform them of the aims and purposes for conducting the research in their schools. Drawing on Josselson (2007), three areas of ethical issues were considered: informed consent or assuring free consent of participants to participate; guarding the confidentiality of the material; and the interview consequences. I informed each participant that in the course of the research, they are free to withdraw from the research at any point they deemed it right to do so. I also obtained informed consent from the various Head of Departments (HODs) of the participating subjects (science and business), the participating teachers, the learners, and the parents of the learners. They were all informed and reassured that the research would not have any adverse effect on them. The aim of the study was explained to the participating schools, teachers and students, which is: *to examine the interface of language and knowledge in multilingual classroom teacher talk in Yola, North-East, Nigeria: using Maton's (2013) Legitimation Code Theory (LCT) and Terminology Theory (Antia, 2000)*. The research methods, which required lesson audio recording, and an after-lesson essay test, were explained.

4.12 Summary of the Chapter

The methodology chapter described the approaches the research undertook to fulfil its aims. A mixed methods approach was adopted, comprising of qualitative and quantitative approaches. It further described the sources of the data and how they were collected. The chapter also explained the data processing technique prior to analysis. It also discussed how the data were analyzed in response to each of the research questions.

CHAPTER 5: FUNCTIONAL ALLOCATION OF LANGUAGES IN MULTILINGUAL TEACHER-TALK

5 Background

This chapter aims to answer two research objectives. The first is research objective one of the study which seeks “to re-examine the claims in the literature in chapter two that there is functional allocation of languages (hereafter FAL) in multilingual classroom teacher-talk”, which corresponds to research question one: “to what extent are the claims in the literature that there FAL in multilingual classroom teacher-talk?” The second objective this chapter aims to answer is research objective two: “to describe the encodings of knowledge in science and business studies lessons”, which also tallies with the research question 2, which is “what are the encodings of knowledge in science and business studies lessons?” We are interested in finding out the different kinds of encodings of knowledge across the disciplines of science and business studies. Data for the analysis will be drawn from both science and business studies lesson transcripts.

This chapter is divided into three main sections. Section one explores objective one of the study “to re-examine the claims in the literature that there is functional allocation of languages in multilingual classroom teacher talk”. Section two examines objective two “to describe the encodings of knowledge in science and business studies lessons”, and Section three discusses the findings in line with the literature.

5.1 Overview of Objective 1 on FAL

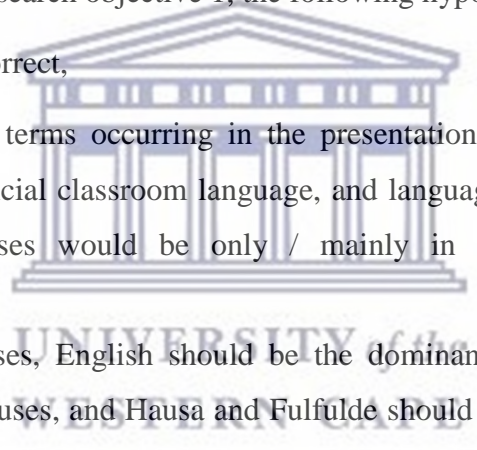
As the literature review chapter shows, the claims of a functional allocation of languages (FAL) in multilingual teacher-talk or classroom code switching has been made across several countries of the world (Tien, 2009; Raschka, Sercombe & Chi-Ling, 2009, in Taiwan; Setati & Adler, 2001; Probyn, 2005 & 2001, in South Africa; Salami, 2008; Igboanusi, 2008; Igboanusi & Peter, 2016; Jegede, 2012; Modupeola, 2013, in Nigeria; Rasman, 2018; Herlina, 2007, in Indonesia; Chowdhury, 2013, in Bangladesh; Garcia, 2009; Seidlitz, 2003; Garcia & Bartlett, 2007, in the US; Vaish & Subhan, 2015, in Singapore).

The literature claimed that in teacher-talk in multilingual classrooms, the official classroom language is always used to present the content of the lesson and the non-official classroom languages are then used to explain or to prepare the students for the contents in the

official language. However, an analysis of these claims shows that they are not backed up by statistics or empirical evidences. One of the problems of our study was to determine just exactly what was meant when the contributors who made these claims of FAL made use of adverbs such as ‘generally’ (Probyn, 2006; Garcia & Bartlett, 2007); ‘often’ (Garcia, 2009; Seidlitz, 2003); ‘frequently’ (Bhatti, Shamsudin & Said, 2018); ‘mainly’ (Mokhtar, 2015); ‘sometimes’, and even the verb ‘tend to’ (Probyn, 2009), and so on. Given this problem (of not quantifying FAL), there is a need to statistically quantify FAL according to the languages used in the classroom. In order to understand the context of this section, or the data to be presented, the section is structured into three major parts: the first part will provide a background to objective 1, while in the second part we will interrogate FAL from the perspective of terms from the data and the third part will investigate FAL from the perspective of clauses.

In order to answer this research objective 1, the following hypotheses were formulated:

Hypothesis: If FAL is correct,

- 
- i) The language of terms occurring in the presentational clauses would be only / mainly in the official classroom language, and language of terms occurring in the explanatory clauses would be only / mainly in the non-official classroom languages.
 - ii) In terms of clauses, English should be the dominant or the only language for presentational clauses, and Hausa and Fulfulde should be the dominant or the only language for explanatory clauses.
 - iii) We expect that the high semantic density (SD+) terms should only / mainly be in the official language which is also the language in which we expect to find the presentational clauses, and the low semantic density (SD-) terms should occur only / mainly in the non-official classroom language which is the language of the explanatory clauses.

These hypotheses were formulated given some of the claims in the literature which we saw in Chapter two.

To investigate objective 1, we first want to employ terms to scrutinize if there really is FAL from our data.

5.1.1 Investigating FAL: The Perspective of Terms

Terms have been described as the building block of disciplinary knowledge without which meaning in clauses are not important (Antia, 2000: xv).

5.1.1.1 Data in respect of hypothesis (i)

In this section, we are interested to determine whether terms in the explanatory clauses are only in the non-official classroom languages, and terms in the presentational clauses are only / mainly in the official classroom language across transcripts.

Table 5.1 below presents the overall distribution of terms, percentage of terms, and mean number of terms per clause (mtpc) across languages in presentational and explanatory clauses.

Transcripts	Number of English terms	Number of Hausa terms	Number of Fulfulde terms
Transcript 1			
Presentational clauses: (Total 35); Eng.= 30, H= 3, F= 2	84 (94.4%) mtpc: 2.8	3 (3.4%) mtpc: 1.0	2 (2.2%) mtpc: 1.0
Explanatory clauses: (Total 25); Eng.= 6, H= 13, F= 6	2 (5.1%) mtpc: 0.3	26 (66.7%) mtpc: 2.0	11 (28.2%) mtpc: 1.8
Transcript 2			
Presentational clauses: (Total 29); Eng. = 24, H= 4, F= 1	58 (90.6%) mtpc: 2.4	5 (7.8%) mtpc: 1.3	1 (1.6%) mtpc: 1.0
Explanatory clauses: (Total 8); Eng.= 4, H= 4, F= 0	8 (30.8%) mtpc: 2.0	12 (46.2%) mtpc: 3.0	6 (terms standing alone) (23.0%)
Transcript 3			
Presentational clauses: (Total 27); Eng.= 24, H= 3, F= 0	37 (94.9%) mtpc: 1.5	2 (5.1%) mtpc: 0.7	0 (0%) mtpc: 0.0
Explanatory clauses: (Total 34); Eng.=30, H= 3, F= 1	12 (26.1%) mtpc: 0.4	3 (20%) MpC: 1.0 (15 terms in the sequence of the lesson)	2 (13.3%) MpC: 2.0 (12 terms in the sequence of the lesson) mtpc: 15.0
Transcript 4			
Presentational clauses: (Total 19); Eng.= 16, H= 3, F= 0	29 (87.9%) mtpc: 1.8	2 (6.1%) mtpc: 0.7	2 (terms standing alone) (6.1%)
Explanatory clauses: (Total 34); Eng. 19, H= 9, F= 6	2 (13.3%) mtpc: 0.006	8 (53.3%) mtpc: 0.9	5 (33.3%) mtpc: 0.8
Transcript 5			
Presentational clauses: (Total 27); Eng.= 24, H= 3, F= 0	31 (100%) mtpc: 1.3	0 (0%) Mtpc: 0.0	0 (0%) mtpc: 0.0
Explanatory clauses: (Total 24); Eng.= 15, H= 6, F= 3	12 (54.5%) mtpc: 0.8	5 (22.7%) mtpc: 0.8	5 (22.7%) mtpc: 1.7
Transcript 6			
Presentational clauses: (Total 34); Eng.= 30, H= 3, F= 1	67 (95.7%) mtpc: 2.2	3 (4.3%) mtpc: 1.0	0 (0%) 0tpc: 0.0

Explanatory clauses: (Total 24); Eng. 15, H= 6, F= 3	7 (50%) mtpc: 0.5	4 (28.6%) mtpc: 0.7	3 (21.4%) mtpc: 1.0
Transcript 7			
Presentational clauses: (Total 23); Eng.= 17, H= 6, F= 0	50 (83.3%) mtpc: 2.9	10 (16.7%) mtpc: 1.7	0 (0%) mtpc: 0.0
Explanatory clauses: (Total 39); Eng.=15, H= 19, F= 5	7 (36.8%) mtpc: 0.5	5 (26.3%) mtpc: 0.3	7 (36.8%) mtpc: 1.4
Transcript 8			
Presentational clauses: Total 18); Eng.=10, H= 4, F= 4	26 (92.9%) mtpc: 2.6	2 (7.1%) mtpc: 0.5	0 (0%) mtpc: 0.0
Explanatory clauses: (Total 12); Eng.= 3, H= 6, F= 3	4 (10%) mtpc: 1.3	16 (40%) mtpc: 2.7	20 (50%) mtpc: 6.6

Table 5.1 Number of terms across languages in presentational and explanatory clauses

Table 5.1 indicates that the percentage range of terms in English in the presentational clauses across the eight transcripts is 83.3% to 100%, whereas the range of Hausa is 0% to 16.7%, and for Fulfulde it is 0% to 6.1%. In terms of FAL, with respect to terms in the presentational clauses, we find from the table that English has the highest average of 80.5%, while Hausa has an average of 5.9%, and Fulfulde a mean of 0.96%. For terms in the explanatory clauses, we find that Hausa has the highest percentage range of 22.7% to 66.6%, compared to the English range of 10% to 54.5%, and Fulfulde with 21.4% to 50%. In other words, the mean of term in the explanatory clauses in Hausa is 40.6%, English 33.5% and Fulfulde 31.0%. In terms of our hypothesis, it seems as if the confirmation will only be with the presentational and not with the explanatory discourses.

Based on the above result, first, part of hypothesis 1 is confirmed in the data. The part that our data is in agreement with is “the language of terms occurring in the presentational clauses would be only / mainly in the official classroom language”. This is evident with the dominance of English terms (a mean of 80.5%) in the presentational clauses.

Second, in terms of the terms in the explanatory clauses, our result contradicts the part of our hypothesis 1 which states that “language of terms occurring in the explanatory clauses would be only / mainly in the non-official classroom languages”. From this hypothesis, the impression is that English (the official classroom language) does not have a very big role in the classroom (in the explanatory), but what this data shows is that English’s role is big. As can be observed from the explanatory terms, the situation is a little bit more complex, because with a mean of 33.5% in English, it is actually competing with Hausa’s mean of 40.6%, and therefore our hypothesis with respect to terms in explanatory clauses is being rejected.

5.1.1.2 What is the dominant FAL in terms across disciplines?

Many of the studies that exist really do not make the distinction (clear) whether FAL is more prevalent in some types of disciplines or in the other types of disciplines. Irrespective of what we have seen in terms and clauses, it is interesting also to see whether FAL works according to disciplines. That is, how terms inform us whether or not FAL works with different disciplines.

Table 5.2 below summarises data on FAL across disciplines.

Types of discourses	Science transcripts			Business transcripts		
	English terms	Hausa terms	Fulfulde term	English terms	Hausa terms	Fulfulde terms
Presentational clauses Science (Total: 132); Eng. = 105, H = 20, F = 7 Business (Total: 80); Eng. = 70, H = 9, F = 1	255 (91.1%)	22 (7.9%)	3 (1.0%)	127 (95.5%)	4 (3.0%)	2 (1.5%)
Explanatory clauses Science (Total: 118); Eng. = 58, H = 45, F = 15 Business (Total: 82); Eng. = 49, H = 21, F = 12	33 (19.4%)	78 (45.9%)	59 (34.7%)	21 (41.2%)	17 (33.3%)	13 (25.5%)

Table 5.2 Distribution of terms per languages across disciplines

Table 5.2 shows that as predicted by FAL terms in English dominate the presentational clauses in both the science and business transcripts, but this does not mean that Fulfulde and Hausa are completely absent. On the other hand, FAL appears contradicted in explanatory clauses, especially in business, where terms in English again dominate. For science, as predicted by FAL, the home languages of Hausa and Fulfulde have more terms. We observed that in science terms, English has a mean of 91.1%, Hausa a mean of 7.9%, and Fulfulde a mean of 1.1%. Likewise in Table 5.2, we noticed in business terms that there is a mean of 95.5% in English, a mean of 3.0% in Hausa, and 1.5% in Fulfulde. With regard to FAL in the explanatory clauses, Hausa has the highest mean of 45.9% in science, Fulfulde 43.7%, and English 19.4%, whereas in business English has the highest mean of 41.2%, Hausa a mean of 33.3%, and Fulfulde 25.5%.

The findings confirm part of our hypothesis 1 which states that “If FAL is correct: The language of terms occurring in the presentational clauses would be only / mainly in the official classroom language, and language of terms occurring in the explanatory clauses

would be only / mainly in the non-official classroom languages.” The part that is in agreement is the dominance of English in the presentational clauses. In other words, looking at it from the standpoint of disciplines, what our data show is that while FAL works for science with English in the presentational clauses, English competes with Hausa in the explanatory discourses in both science and business transcripts. Although FAL works in business in the presentational clause with English, FAL does not work for business, because English further dominates the explanatory discourses.

Let us now consider FAL with respect to levels of study, that is, JSS1 (Grade 7) and JSS3 (Grade 9).

5.1.1.3 What is the dominant FAL in terms across grade types?

In this subsection of chapter 5, we are interested in using our data to scrutinize FAL from the standpoint of grade levels.

Table 5.3 summarises data on FAL across grade levels.

Types of discourses	JSS1 (Grade 7)			JSS3 (Grade 9)		
	English terms	Hausa terms	Fulfulde terms	English terms	Hausa terms	Fulfulde terms
Presentational clauses JSS1 (Grade 7) (Total: 87); Eng. = 67, H = 16, F = 4 JSS3 (Grade 9) (Total: 125); Eng. = 108, H = 13, F = 4	136 (89.5%)	14 (9.2%)	2 (1.3%)	246 (93.9%)	13 (4.96%)	3 (1.1%)
Explanatory clauses JSS1 (Grade 7) (Total: 109); Eng. = 52, H = 40, F = 17 JSS3 (Grade 9) (Total: 91); Eng. = 55, H = 26, F = 10	25 (26%)	34 (35.4%)	37 (38.5%)	29 (23.2%)	61 (48.8%)	35 (28%)

Table 5.3 Distribution of terms per languages across Grade levels

Table 5.3 shows that, as predicted by FAL, terminology in English is dominant in the presentational clauses in both JSS1 (Grade 7) and JSS3 (Grade 9) transcripts. The fact is that the presentational discourse exclusively in English can be seen in the admittedly low percentages for Fulfulde and Hausa. For the explanatory discourses, although English terminology accounts for the least percentage at both levels, it is however not insignificant, meaning that English also plays an important role in the explanatory discourses. We observed that in JSS1 (Grade 7) terms, English has a mean of 89.5%, Hausa a mean of 9.2%, and

Fulfulde a mean of 1.3%. In Table 5.3, we also noticed in JSS3 (Grade 9) terms that there is a mean of 93.9% in English, a mean of 4.96% in Hausa, and an average of 1.5% in Fulfulde. In terms of FAL in the explanatory discourses, Fulfulde has the highest mean of 38.5% in JSS1 (Grade 7), Hausa 35.4%, and English 26%, while in JSS3 (Grade 9) Hausa has a maximum mean of 48.8%, a mean of 28% in Fulfulde, and a mean of 23.2% in English.

These findings confirm part of hypothesis 1 which states that “If FAL is correct: The language of terms occurring in the presentational clauses would be only / mainly in the official classroom language, and language of terms occurring in the explanatory clauses would be only / mainly in the non-official classroom languages”, with regards to presentational discourses. For instance, from our data English is evidently dominant in the presentational with a mean of 89.5% occurrence of terms in JSS1 (Grade 7) and 93.9% occurrence of terms in JSS3 (Grade 9). Interestingly, even if we added together the means of both Hausa (9.2%) and Fulfulde (1.3%) of JSS1 (Grade 7) terms to the means of both Hausa (4.96%) and Fulfulde (1.5%) of JSS3 (Grade 9) terms in the presentational clauses, the combined statistics would still not be greater than English. With the idea of FAL, one could think that English does not have a role in the explanatory discourses, but our data reveals that English does have a significant role.

Having addressed FAL from the perspectives of levels of study, let us turn to FAL across school types.



5.1.1.4 To what extent does FAL occur in terms across school types?

In most of the studies discussed in the literature in chapter two, we notice from the descriptions that the schools may not be elitist or high in socio-economic status, which leads to the assumption that FAL happens more exclusively in rural and/or public schools, or less privileged / disadvantaged schools. In this section, we want to find out whether FAL occurs in different school types.

Table 5.4 summarises data on FAL across school types.

Types of discourses	Public schools			Private schools		
	English terms	Hausa terms	Fulfulde terms	English terms	Hausa terms	Fulfulde terms
Presentational clauses: Private schools (Total: 148); Eng. =125, H = 19, F =4 Public schools (Total: 64); Eng. = 50, H =10, F = 4	92 (92%)	6 (6%)	2 (2%)	290 (92.4%)	21 (6.7%)	3 (0.9%)
Presentational clauses: Private schools (Total: 120); Eng. =55, H = 48, F = 17 Public schools (Total: 80); Eng. = 52, H = 18, F = 10	18 (17.8%)	43 (42.6%)	40 (39.6%)	36 (30%)	52 (43.3%)	32 (26.7%)

Table 5.4 Distributions of terms per languages school types

Table 5.4 indicates that with terms, FAL is dominant in English in the presentational clauses in both public school and private school lessons. The table reveals that, in public schools, there is a mean of 92% of terms in English, a mean of 6% of terms in Hausa, and a mean of 2% of terms in Fulfulde. In private schools, the mean of terms in the presentational clauses in English is 92.4%, a mean of 6.7% in Hausa, and a mean of 0.9% in Fulfulde. In terms of FAL in the explanatory discourses, in public schools, Hausa has the highest mean of 42.6% of terms, Fulfulde 39.6%, and English 17.8%. Likewise, in private schools, Hausa accounts for the highest mean of 43.3% of terms, followed by a mean of 30% of terms in English, and an average of 26.7% of terms in Fulfulde.

In terms of the terms that exist in public schools, our hypothesis 2 states that: “If the FAL is correct, English should appear only / mainly in the instructional / presentational and therefore hardly in the explanatory, and that Hausa and Fulfulde should appear only / mainly in the explanatory and hardly in the presentational”. Both parts of the hypothesis have been confirmed by our data. English clearly dominates the presentational discourses with a mean of 92% in public schools and 92.4% in private schools. With regards to terms in the explanatory clauses, the part of the hypothesis that says, “If FAL is correct, Hausa and Fulfulde should appear only / mainly in the explanatory and hardly in the presentational”, and that English does not have a role, has been rejected. English has a mean of 17.8% in public schools and 30% in private schools, and is actually competing with Hausa.

Having observed the overall patterns of terms and in the different variables (disciplines, subject types and school types) in the presentational clauses and the explanatory clauses, the following subsections discuss the patterns of FAL that occur within clauses across subject types, grade levels and school types.

5.2 Investigating FAL: the perspective of clauses

Clauses are “units of grammatical organization next below the sentence in rank and in traditional grammar said to consist of a subject and predicate” (Nguyễn, 2012). In other words, clauses are groups of words that have both subjects and predicates.

5.2.1 Data In Respect of Hypothesis ii Above

Our study seeks to find out whether FAL actually exists according to clauses. Table 5.5 below presents the overall distribution of clauses and percentage of clauses per language across presentational and explanatory registers.

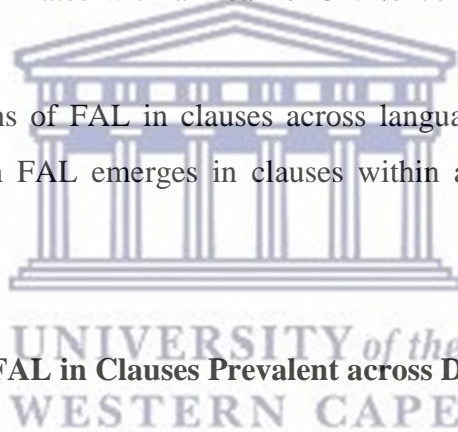
Transcripts	Number of English clauses	Number of Hausa clauses	Number of Fulfulde clauses
Transcript 1			
Presentational clauses: 35	30 (85.7%)	3 (8.6%)	2 (5.7%)
Explanatory clauses: 25	6 (24%)	13 (52%)	6 (24%)
Transcript 2			
Presentational clauses: 29	24 (82.8%)	4 (13.8%)	1 (3.4%)
Explanatory clauses: 8	4 (50%)	4 (50%)	0
Transcript 3			
Presentational clauses: 27	24 (88.9%)	3 (11.1%)	0 (0%)
Explanatory clauses: 34	30 (88.2%)	3 (8.8%)	1 (2.9%)
Transcript 4			
Presentational clauses: 19	16 (84.2%)	3 (15.8%)	0 (0%)
Explanatory clauses: 34	19 (55.9%)	9 (26.5%)	6 (17.6%)
Transcript 5			
Presentational clauses: 27	24 (88.9%)	3 (11.1%)	0 (0%)
Explanatory clauses: 24	15 (62.5%)	6 (25%)	3 (12.5%)
Transcript 6			
Presentational clauses: 34	30 (88.2%)	3 (8.8%)	1 (2.9%)
Explanatory clauses: 24	15 (62.5%)	6 (25%)	3 (12.5%)
Transcript 7			
Presentational clauses: 23	17 (73.9%)	6 (26.1%)	0 (0%)
Explanatory clauses: 39	15 (38.5%)	19 (48.7%)	5 (12.8%)
Transcript 8			
Presentational clauses: 18	10 (55.6%)	4 (27.8%)	4 (27.8%)
Explanatory clauses: 12	3 (25%)	6 (50%)	3 (25%)

Table 5.5 Overall distributions of clauses across languages

Table 5.5 indicates that the percentage range of presentational clauses in English across eight transcripts is 55.6% to 88.9%, the range in Hausa is 8.8% to 27.8%, and Fulfulde is 0.0% to 27.8%. In terms of FAL, with respect to presentational clauses, we find from Table 5.5 that English has the highest average of 81%, while Hausa has an average of 15.4%, and Fulfulde a mean of 1.5%. In the explanatory clauses, the percentage range of 24% to 88.2% was recorded in English, while the range in Hausa is 8.8% to 52%, and Fulfulde is 0% to 25%. With regards to FAL in the explanatory clauses, English has a mean of 51.4%, the mean in Hausa is 35.8%, and for Fulfulde is 13.4%.

These results confirm part of hypothesis 1 that says: “If FAL is correct, in terms of clauses, English should be the dominant or the only language for presentational clauses and Hausa and Fulfulde should be the dominant or the only language for explanatory clauses”. Conversely, the results contradict part of our hypothesis with regard to the explanatory clauses. English further dominates with a mean of 51.4% compared to Hausa’s 35%, and Fulfulde’s 13.4%.

Given the overall patterns of FAL in clauses across languages, the subsequent sections present the extent to which FAL emerges in clauses within and across disciplines, grade levels and school types.



5.2.2 To What Extent is FAL in Clauses Prevalent across Disciplines?

Table 5.6 below summarises data on clauses across disciplines.

Subject types: clauses						
Types of discourses	Science			Business		
	English clauses	Hausa clauses	Fulfulde clauses	English clauses	Hausa clauses	Fulfulde clauses
Presentational clauses	105 (77.4%)	20 (17.5%)	7 (14.7%)	70 (87.1%)	9 (11.9%)	1 (0.96%)
Explanatory clauses	58 (51.3%)	45 (41.9%)	15 (12.9%)	49 (60.3%)	21 (25.5%)	12 (14.2%)

Table 5.6 Distributions of clauses per languages across subject types

Table 5.6 shows that English has the highest number of clauses in presentational discourses across science and business lessons. In science, English has an average of 77.4%, Hausa has an average of 17.5%, and Fulfulde a mean of 7.4%. Correspondingly, in business, English has a mean of 87.1%, Hausa a mean of 11.9%, and Fulfulde 0.96%. With respect to

clauses in the explanatory discourses, science English has a mean of 51.3%, a mean of 41.9% in Hausa, and a mean of 12.9% in Fulfulde. Likewise in business discourses, English accounts for a mean of 60.3%, Hausa a mean of 25.5%, and Fulfulde 14.2%.

These findings confirm part of hypothesis 2 in that: “If FAL is correct, in terms of clauses, English should be the dominant or the only language for presentational clauses and Hausa and Fulfulde should be the dominant or the only language for explanatory clauses”. The part that is in agreement with our data is “English should be the dominant or the only language for presentational clauses”. However, with respect to clauses in the explanatory discourses, our data has rejected the part of the hypothesis that states “Hausa and Fulfulde should be the dominant or the only language for explanatory clauses”, because English has dominance in both science (51.3%) and business (60.3%) in the explanatory discourses.

5.2.3 To what extent does FAL in Ccauses dominate across grade types?

Table 5.7 below summarises data on clauses across grade levels.

Types of discourses	Grade levels: clauses					
	JSS1 (Grade 7)			JSS3 (Grade 9)		
	English clauses	Hausa clauses	Fulfulde clauses	English clauses	Hausa clauses	Fulfulde clauses
Presentational discourses	67 (75.7%)	16 (20.2%)	4 (6.95%)	108 (86.4%)	13 (10.6%)	4 (3.0%)
Explanatory discourses	52 (45.5%)	40 (25.1%)	17 (16.9%)	55 (56.2%)	26 (33.95%)	10 (9.9%)

Table 5.7 Distribution of clauses per language across grade levels

Table 5.7 shows that in the presentational discourses, English accounts for the most clauses across JSS1 (Grade 7) and JSS3 (Grade 9) transcripts. In JSS1 (Grade 7), a mean of 75.7% is recorded for English, a mean of 20.2% in Hausa, and an average of 6.96% in Fulfulde. Table 5.7 also shows that in JSS3 (Grade 9), English accounts for the highest mean of 86.4%, Hausa has a mean of 10.6%, and Fulfulde a mean of 3.0%. In terms of FAL in the explanatory discourses, we notice in JSS1 (Grade 7) clauses that English has a mean of 45.5%, a mean of 25.1% in Hausa, and a mean of 16.9% in Fulfulde. In business explanatory discourses, English accounts for the highest mean of 56.2%, Hausa a mean of 33.95%, and a mean of 9.9% in Fulfulde.

These results partially confirm our hypothesis 2, which states “If FAL is correct, in terms of clauses, English should be the dominant or the only language for presentational clauses and Hausa and Fulfulde should be the dominant or the only language for explanatory clauses”. The portion of the hypothesis that is correct is the dominance of English in the presentational discourses with a mean of 75.7% of occurrences in clauses in JSS1 (Grade 7), and a mean of 86.4% of occurrences in clauses in JSS3 (Grade 9). It is interesting to note that, even if the means of Hausa (20.2%) and Fulfulde (6.95%) in JSS1 and the means of Hausa (10.6%) and Fulfulde (3.0%) in JSS3 are combined, the combined statistics still would not be bigger than the English. However, in the explanatory clauses, our data did not confirm part of the hypothesis on the basis that “Hausa and Fulfulde should be the dominant or the only language for explanatory clauses”, which gives the impression that English does not have role in the explanatory segment. What we find from the data across grade levels is that English also dominates the explanatory discourses with a mean of 56.2% of clauses in JSS3 (Grade 9) and a mean of 45.5% of the clauses in JSS1 (Grade 7).

5.2.4 To what extent is FAL in clauses prevalent across school types?

Table 5.8 below summarises data on clauses across school types.

School types: clauses						
Types of discourses	Private schools			Public schools		
	English clauses	Hausa clauses	Fulfulde clauses	English clauses	Hausa clauses	Fulfulde clauses
Presentational discourses	50 (76.2%)	10 (18.2%)	4 (9.3%)	125 (83.9%)	19 (13.7%)	7 (4.0%)
Explanatory discourses	52 (56.4%)	18 (28.4%)	10 (15.2%)	55 (47.5%)	48 (40.1%)	17 (12.4%)

Table 5.8 Distribution of clauses per languages across school types

Table 5.8 shows that in the presentational discourses, English clauses are more prevalent in both public school and private school lessons. In private schools, English accounts for a mean of 76.2%, Hausa has a mean of 18.2%, and Fulfulde an average of 9.3%. In public schools, we notice a mean of 83.9% in English, a mean of 13.7% in Hausa, and a mean of 4.0% in Fulfulde. With respect to the explanatory discourses, we observe that, in private school clauses, English has a mean of 56.4%, Hausa has a mean of 28.4%, and a mean of 15.2% in Fulfulde. In public schools in the explanatory discourses, English has the highest mean of 47.5%, Hausa a mean of 40.1%, and a mean of 12.4% in Fulfulde.

The results show that our hypothesis 2, which states that “If FAL is correct, in terms of clauses, English should be the dominant or the only language for presentational clauses and Hausa and Fulfulde should be the dominant or the only language for explanatory clauses”, is partially correct. The part that is correct is the dominance of English in the presentational clauses in both private schools and public schools. In the explanatory discourses, however, part of the hypothesis, that “If FAL is correct: Hausa and Fulfulde should be the dominant or the only language for explanatory clauses”, has not been supported. In fact, English is not only competing with Hausa, but has dominated the explanatory discourses.

Let us turn to a different perspective for viewing the data. Rather than work only with the superficial presentational/explanatory discourse distinction, we incorporate LCT semantics.

5.3 Investigating FAL: perspective of encodings of knowledge

This section of the study answers research objective 2: “to describe the encodings of knowledge in science and business studies classrooms”. This objective seeks to determine how different encodings of knowledge occur across disciplines, grade levels and school types with reference to LCT code of semantic density (SD+, SD-). This section is divided into four parts. Part one presents the overview of the encoding of knowledge across eight lesson transcripts; part two examines the encodings of knowledge across disciplines; part three explores the encodings of knowledge that are available in various grade levels, and part four investigates the different encodings of knowledge in private schools versus public schools.

5.3.1 Data in respect of hypothesis (iii)

In order to draw on LCT lenses to actually see and to problematize the claims of FAL, we need to look at the position of SD+ terms and where the SD- terms are in the preceding subsections of the chapter. The question is: are we going to find the majority of the SD+ terms in English and the majority of SD- terms in Hausa and Fulfulde?

Table 5.9 presents the overall distributions of SD+, SD- terms, percentage of terms and mean number of terms per clause (mtpc) across languages in presentational and explanatory clauses.

Transcripts	Number of English terms		Number of Hausa terms		Number of Fulfulde terms	
	SD+	SD-	SD+	SD-	SD+	SD-
Transcript 1						
Presentational clauses: (Total 35); Eng.= 30, H= 3, F=2	75 (96.2%) mtpC: 2.5	1 (100%) mtpC: 0.03	1 (1.3%) mtpC: 0.3	N/A	2 (2.6%) mtpC: 1.0	N/A
Explanatory clauses: (Total 25); Eng.= 6, H= 13, F= 6	9 (81.8%) mtpC: 1.5	1 (2.8%) mtpC: 0.2	2 (18.2%) mtpC: 0.2	24 (66.7%) mtpC: 1.8	N/A	11 (30.6%) mtpC: 1.8
Transcript 2						
Presentational clauses: (Total 29); Eng.= 24, H= 4, F= 1	45 (90%) mtpC: 1.6	9 (90%) mtpC:0.4	4 (8%) mtpC: 1.0	N/A	1 (2%) mtpC: 1.0	1 (10%) mtpC: 1.0
Explanatory clauses: (Total 8); Eng.= 4, H= 4, F= 0	13 (92.9%) mtpC: 3.3	1 (8.3%) mtpC: 0.03	1 (7.1%) mtpC: 0.3	11 (91.7%) mtpC:2.8	N/A	6* (23.0%) *These are stand-alone terms not occurring in clauses
Transcript 3						
Presentational clauses: (Total 27); Eng.=24, H= 3, F= 0	28 (93.3%) mtpC: 1.2	N/A	2 (6.7%) mtpC: 0.7	1 (100%) mtpC: 0.3	N/A	N/A
Explanatory clauses: (Total 34); Eng.=30, H= 3, F= 1	10 (90.9%) mtpC: 0.3	10 (66.7%) mtpC: 0.3	N/A	3 (20%) mtpC: 1.0 (15 terms in the sequence of the lesson)	1 (9.1%) mtpC: 1.0	2 (13.3%) mtpC: 2.0 (12 terms in the sequence of the lesson)
Transcript 4						
Presentational clauses: (Total 19); Eng.= 16, H= 3, F= 0	19 (95%) mtpC: 1.2	N/A	1 (5%) mtpC: 0.3	N/A	N/A	N/A
Explanatory clauses: (Total 34); Eng.= 19, H= 9, F= 6	8 (72.7%) mtpC: 0.4	2 (13.3%) mtpC: 0.1	1 (9.1%) mtpC: 0.1	8 (53.3%) mtpC: 0.9	2 18.2%) mtpC: 0.3	5 (33.3%) mtpC: 0.8
Transcript 5						
Presentational clauses: (Total 27); Eng.=24, H= 3, F= 0	Total = 30 (100%) MpC: 1.3	Total=11 (84.6%) MpC:0.5	N/A	Total = 2 (15.4%) MpC: 0.7	N/A	5* *These are stand-alone terms not occurring in clauses (terms
Explanatory clauses: (Total 24); Eng.= 15, H= 6, F= 3	1 (100%)	1 (25%)	N/A	3 (75%)	N/A	N/A

	mtpC: 0.07	mtpC: 0.06		mtpC: 0.5		
Transcript 6						
Presentational clauses: (Total 34); Eng.= 30, H= 3, F= 1	67 (95.7%) mtpC: 2.2	N/A	3 (4.3%) mtpC: 1.0	N/A	N/A	N/A
Explanatory clauses: (Total 24); Eng.= 15, H= 6, F= 3	5 (83.3%) mtpC:0.3	7 (46.7%) mtpC: 0.4	1 (16.7%) mtpC: 0.2	5 (33.3%) mtpC: 0.83	N/A	3 (20%) mtpC: 1.0
Transcript 7						
Presentational clauses: (Total 23); Eng.= 17, H= 6, F= 0	39 (92.9%) mtpC: 2.3	6 (42.9%) mtpC: 0.4	3 (7.1%) mtpC: 0.5	8 (57.1%) mtpC: 1.3	N/A	N/A
Explanatory clauses: (Total 39); Eng.= 15, H= 19, F= 5	8 (80%) mtpC: 0.5	3 (20%) mtpC: 0.2	2 (20%) mtpC: 0.1	5 (33.3%) mtpC: 0.3	N/A	7 (46.7%) mtpC: 1.4
Transcript 8						
Presentational clauses: (Total 18); Eng.= 10, H= 4, F= 4	24 (100%) mtpC: 2.4	2 (22.2%) mtpC: 0.2	N/A	3 (33.3%) mtpC:1.8	N/A	4 (44.4%) mtpC: 1.0
Explanatory clauses: (Total 12); Eng.= 3, H= 6, F= 3	Total = 1 (33.3%) MpC: 0.3	Total = 3 (9.4%) MpC: 1.0	Total = 2 (66.7%) MpC: 0.3	Total =13 (40.6%) MpC:2.2	N/A	Total = 16 (50%) MpC: 5.3

Table 5.9 Distributions of encodings of knowledge per language across transcripts

Table 5.9 shows that there are altogether 410 SD+ terms throughout the eight transcripts. We have a total of 381 SD+ terms in English, 23 SD+ terms in Hausa, and 6 SD+ terms in Fulfulde. In terms of FAL, with respect to SD+ terms, we find that the highest percentage mean of 92.9% is in English, the mean of 5.6% of SD+ terms is in Hausa, and an average of 1.5% SD+ terms in Fulfulde. In terms of SD- terms, which are linked to the explanatory clauses, we have a total of 202 SD- terms of which the highest mean of 42.6% occurs in Hausa, an average of 29.2% of SD- terms in Fulfulde terms, and a mean of 28.2% in English.

Going by this finding, hypothesis 3, which states that “If FAL is correct, we expect that the high semantic density (SD+) terms should only / mainly be in the official language which is also the language in which we expect to find the presentational clauses, and the low semantic density (SD-) terms should occur only / mainly in the non-official classroom language which is the language of the explanatory clauses”, is partially correct. The part that confirmed our hypothesis is the dominance of English in the SD+ terms, with a mean of 92.9%. However, with regards to SD- terms, our hypothesis has not been confirmed. As in previous sections, what is emerging is one a more nuanced picture of FAL.

5.3.2 What are the patterns of encodings of knowledge across science and business transcripts?

Table 5.10 below summarises data on encodings of knowledge across disciplines.



Disciplines	Science transcripts						Business transcripts					
Types of discourses	English terms		Hausa terms		Fulfulde term		English terms		Hausa terms		Fulfulde terms	
	SD+	SD-	SD+	SD-	SD+	SD-	SD+	SD-	SD+	SD-	SD+	SD-
Presentational clauses Science (Total: 132); Eng. = 105, H = 20, F = 7 Business (Total: 80); Eng. = 70, H = 9, F = 1	211 (94.5%) MtpC: 2.0	18 (51%) MtpC: 0.21	10 (4.6%) MtpC: 0.5	12 (38.1%) MtpC: 0.7	3 (0.9%) MtpC: 0.4	5 (10.9%) MtpC: 0.4	116 (96.9%) MtpC: 1.7	11 (28.2%) MtpC: 0.5	4 (3.1%) MtpC: 0.4	2 (5.1%) MtpC: 0.2	N/A	N/A
Explanatory clauses Science (Total: 118); Eng. = 58, H = 45, F = 15 Business (Total: 82); Eng. = 49, H = 21, F = 12	41 (75.8%) MtpC: 1.2	18 (21.4%) MtpC: 0.31	7 (22.4%) MtpC: 0.2	58 (50.5%) MtpC: 1.6	1 (1.8%) MtpC: 0.2	36 (28.1%) MtpC: 2.1	14 (85.3%) MtpC: 0.3	10 (28.3%) MtpC: 0.3	2 (8.6%) MtpC: 0.1	16 (53.8%) MtpC: 0.7	2 (6.1%) MtpC: 0.1	11 (17.8%) MtpC: 0.6

Table 5.10 Distribution of SD+, SD-terms per languages across disciplines

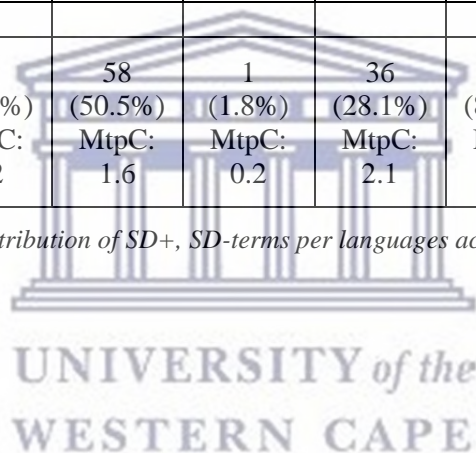


Table 5.10 indicates that the highest occurrence of SD+ terms within disciplines across presentational clauses is in English. We notice that in science, there is a mean of 94.5% of SD+ terms occurring in English, a mean of 4.6% in Hausa, and in Fulfulde a mean of 0.9%. For business, we note that English has the highest percentage mean of 95%, Hausa with the mean of 3.8% and a mean of 1.3% in Fulfulde.

With respect to the SD- terms, which are linked to explanatory discourses in the lessons, we observe in science that Hausa has a mean of 50.5%, a mean of 28.1% in Fulfulde and a mean of 21.4% in English. Equally, in business, Hausa dominates with a mean of 52.9%, while a mean of 30.9% in English and a mean of 16.2% in Fulfulde

Based on this analysis, our hypothesis 3 which states that “If FAL is correct: The high semantic density (SD+) terms should only/mainly be in the official language which is also the language in which we expect to find the presentational clauses and the low semantic density (SD-) terms should occur only/mainly in the non-official classroom language which is the language of the explanatory clauses” has been confirmed with the presentational clauses in both science and business where English dominates with a mean of 94.5% in science and 96.9% in business. However, the hypothesis is not proven with respect to the explanatory discourses and the non-official languages as far as SD- is concerned within science and business lessons. English, the official classroom language competes with Hausa and Fulfulde, the non-official classroom languages in both science and business lesson.

5.3.3 What are the patterns of encodings of knowledge across grade levels transcripts?

Table 5.11 uncovers the kinds of encodings of knowledge that occur in JSS1 (Grade 7) and JSS3 (Grade 9) lessons. Table 5.11 below summarises data on encodings knowledge across grade levels.

Grade levels	JSS3 (Grade 9)						JSS1 (Grade 7)					
Types of discourses	English terms		Hausa terms		Fulfulde term		English terms		Hausa terms		Fulfulde terms	
	SD+	SD-	SD+	SD-	SD+	SD-	SD+	SD-	SD+	SD-	SD+	SD-
Presentational clauses Science (Total: 132); Eng. = 105, H = 20, F = 7 Business (Total: 80); Eng. = 70, H = 9, F = 1	215 (93.8%) MtpC: 1.9	10 (47.5%) MtpC: 0.1	10 (5.1%) MtpC: 0.8	1 (25%) MtpC: 0.08	3 (1.2%) MtpC: 0.5	1 (2.5%) MtpC: 0.3	112 (96.97 %) MtpC: 1.8	19 (37.4%) MtpC: 0.3	4 (3.0%) MtpC: 0.2	13 (26.4%) MtpC: 0.9	N/A	4 (11.1%) MtpC: 0.3
Explanatory clauses Science (Total: 118); Eng. = 58, H = 45, F = 15 Business (Total: 82); Eng. = 49, H = 21, F = 12	37 (87.2%) MtpC: 1.4	19 (31.1%) MtpC: 0.2	4 (10.5%) MtpC: 0.2	43 (52.9%) MtpC: 1.6	6 (10.6%) MtpC: 0.3	16 (15.97 %) MtpC: 1.2	18 (71.5%) MtpC: 0.3	9 (16.6%) MtpC: 0.3	5 (23.9%) MtpC: 0.1	29 (50.6%) MtpC: 0.97	2 (4.6%) MtpC: 0.08	28 (32.5%) MtpC: 1.9

Table 5.11 Distributions of SD+, SD-terms per languages across grade levels

Table 5.11 reveals that English has the highest occurrences of SD+ terms across grade levels in presentational clauses. We observe that within the number of SD+ terms in JSS3 (Grade 9), English has a mean of 93.8% of SD+ terms, Hausa has a mean of 5.1%, and Fulfulde a mean of 1.2%. In JSS1 (Grade 7), we also found that English has the largest percentage mean of 96.97% of SD+ terms in the presentational clauses, a mean of 3.0% in Hausa, and a mean of 0% in Fulfulde.

With respect to the SD- terms, which are associated with explanatory discourses in the lessons, we discern from JSS3 (Grade 9) that Hausa accounts for a mean of 52.9%, English has a mean of 31.1%, and Fulfulde a mean of 15.7%. Likewise in JSS1 (Grade 7), Hausa dominates with a mean of 50.6%, Fulfulde accounts for a mean of 32.5%, and English has a mean of 16.6%.

In both JSS3 (Grade 9) and JSS1 (Grade 7), our hypothesis which states “If FAL is correct, we expect that the high semantic density (SD+) terms should only/mainly be in the official language which is also the language in which we expect to find the presentational clauses and the low semantic density (SD-) terms should occur only/mainly in the non-official classroom language which is the language of the explanatory clauses” has partially been confirmed. The part that has been confirmed is the dominance of English in SD+ with a mean of 96.97% in JSS1 (Grade 7) and a mean of 93.8% in JSS3 (Grade 9). However, our findings reject the hypothesis with respect to the explanatory clauses and the non-official classroom languages. Contrary to FAL that English does not have a role to play in the explanatory segment, it accounts for 16.6% in explanatory clauses in JSS1 (Grade 7) and 31.1% in JSS3 (Grade 9)

5.3.4 What are the patterns of encodings of knowledge across school types?

Table 5.12 below summarises data on encodings knowledge across school types.

Schools types	Public schools						Private schools					
Types of discourses	English terms		Hausa terms		Fulfulde term		English terms		Hausa terms		Fulfulde terms	
	SD+	SD-	SD+	SD-	SD+	SD-	SD+	SD-	SD+	SD-	SD+	SD-
Presentational clauses Science (Total: 132); Eng. = 105, H = 20, F = 7 Business (Total: 80); Eng. = 70, H = 9, F = 1	71 (96.1%) MtpC: 1.8	3 (7.4%) MtpC: 0.07	3 (3.9%) MtpC: 0.3	4 (44.4%) MtpC: 0.7	N/A	4 (14.8%) MtpC: 0.3	256 (94.96%) MtpC: 1.98	27 (63.5%) MtpC: 0.3	11 (4.1%) MtpC: 0.6	10 (14.5%) MtpC: 0.4	3 (0.9%) MtpC: 0.4	1 (2%) MtpC: 0.2
Explanatory clauses Science (Total: 118); Eng. = 58, H = 45, F = 15 Business (Total: 82); Eng. = 49, H = 21, F = 12	19 (87.9%) MtpC: 1.03	15 (29.8) MtpC: 0.5	3 (25.3%) MtpC: 0.1	24 (37.96%) MtpC: 1.0	3 (9.1%) MtpC: 0.3	23 (32.2%) MtpC: 2.7	36 (87.6%) MtpC: 1.1	13 (20.6%) MtpC: 0.4	6 (12.4%) MtpC: 0.2	48 (60%) MtpC: 1.2	N/A	21 (19.4%) MtpC: 0.8

Table 5.12 Distribution of SD+, SD-terms per languages across school types

Table 5.12 indicates that in the presentational clauses the language with the highest occurrence of SD+ terms across school types is English. In public school lesson transcripts, there is a mean of 96.1% of SD+ terms, while a mean of 3.9% in Hausa and a mean of 0% in Fulfulde. Similarly, in private school transcripts, English has the highest mean of 94.96% of SD+ terms in the presentational clauses, whereas Hausa has a mean of 4.1%, and a mean of 0.9% occurs in Fulfulde. In terms of SD- terms occurring within the explanatory discourses in the lessons, we identified that in the public schools, Hausa accounts for a mean of 37.96%, Fulfulde a mean of 32.2%, and English a mean of 29.8%. Equally, in private schools, Hausa dominates with the highest mean of 60%, English accounts for a mean of 20.6 %, and a mean of 19.4% in Fulfulde.

The implication of this finding is that part of our hypothesis 3, “If FAL is correct, we expect that the high semantic density (SD+) terms should only / mainly be in the official language which is also the language in which we expect to find the presentational clauses”, has been confirmed by the data in both private schools and public schools. When we look at the findings on the SD- terms in both private schools and the public schools, we realize that the part of hypothesis 3 that states “the low semantic density (SD-) terms should occur only / mainly in the non-official classroom language which is the language of the explanatory clauses”, has been rejected by our data.

5.4 Discussion

Given the literature on FAL, it is easy to talk of translanguaging or code switching as taking place in teaching and learning, and therefore there will be no problem for multilingual learners who are strong in the non-official language and weak in the official language, since all languages are supposedly being accommodated.

However, our work has shown that in quantifying, even though at times we see that Hausa, English and Fulfulde are used in the explanatory discourses, the truth is that, even English (the official language) has almost the same number of clauses or terms, and sometimes more, than Hausa and Fulfulde (the non-official languages) in the explanatory discourses (transcripts 5, 6 and 7). This means that, somehow, children who are weak in the official language are being short-changed.

Effectively, the use of the learners' languages in linguistically diverse classrooms "increases learner participation and lesson comprehension" (Mokgwathi & Webb, 2013:108). Many studies have indicated that learning and cognition are linked (Macaro, 2005). Macaro (2005:74) argues that code switching is used by teachers in multilingual lessons "in order to lighten the cognitive load problems in working memory" of the learners as they cope with the knowledge being communicated in the class. However, in a multilingual classroom talk where the teacher uses very little translanguaging or code switching, and then claims that the learners' main languages (in this case Hausa and Fulfulde) are being used, the question we need to pose is, for that single Hausa term that was used, how many times was English used in the explanatory clauses? As our overall data shows, English challenges the Hausa and Fulfulde in the explanatory discourses.

Of course, this raises the question of fairness in learning (OECD, 2012; Esmonde, 2009; Keith, 2015; Ainscow, 2016), where learners who are weak in the official language are deprived of equitable access to learning. If a learner "expects the teacher to use translation and grammatical explanation he will be disappointed by a strictly monolingual teaching in the lesson" (Cook, 1979:166). This is because the language policy governing teaching and learning does not support multilingual access to knowledge. Equitable access is "the fair distribution of opportunities to learn" (Esmonde, 2009:1008). In other words, it is the teacher's ability to work towards accommodating each and every learner in the classroom. As García-Mateus and Palmer (2017:245) explain in their study of one teacher in a first grade classroom in Hillside Elementary school in southwestern United States: "Translanguaging offers equitable access to education by emergent bilinguals." In terms of equitable access to learning, Keith (2015:6) observed that "some practices by teachers undermine quality learning and diminish access" to learning. This now makes us wonder whether what our literature claims about translanguaging or code switching is fair or equitable. The fact this language (Hausa) appears, is that enough? Although in the explanatory discourses, English (the official classroom language) has a mean of 51.4% instances of clauses, 33.5% mean of occurrences of terms and an average of 28.2% SD- terms, while the non-official classroom language, Hausa in the explanatory discourses has a mean of 35.8% in clauses, a mean of 40.6% of terms and a mean of 42.6% in SD- terms, it is assumed that there is translanguaging and every learner has been accommodated. Most research on cognition has shown that the development of academic proficiency in two languages has been associated with enhancements in cognitive function (Cook, 1979; Macro, 2005; Garcia, Kleifgen & Falchi,

2008). Cook (1979:167), however, observed that one aspect that often fails to be noticed by teachers “is the memory processes that the learner uses for thinking and for processing language”.

Cognitive benefits of bilingualism have been found “to be an important factor in cognitive development” (Garcia, Kleifgen & Falchi, 2008: 31). New learning has to be repeated and reinforced, because memories are formed as links between the nerve cells in the brain when the pathway is used several times (Saville, 2009:69; Saidi & Ansaldo, 2017:2). In other words, repetition helps to improve speed, increases confidence, and strengthens the connections in the brain that help children learn.

Following from the above, it is not always the case that the official classroom language is for the instructional discourse and the non-official classroom language is for regulatory discourse. Our data suggest that sometimes the non-official classroom language can also be used for instructional discourse. We also observed from our literature in chapter two that it was not always the case that the presentational discourse is in the official language, sometimes it appeared in the non-official classroom languages.

It is interesting that even though we have very few examples of studies in our data, it has also been confirmed in some other studies (Probyn, 2019; McKinney & Tyler, 2019; Probyn, 2006, 2009 in South Africa; Igboanusi, 2008; Igboanusi & Peter, 2016 in Nigeria). For instance, Probyn (2019) examined the role of languages in teaching and learning in Grade 8 science classes in township schools in the Eastern Cape where the home language of the learners and teachers is isiXhosa and the language of learning and teaching is English. Eight science teachers were recruited for the study. Data were collected using videotapes of five science lessons for each of eight science teachers on their classroom language practices. The recorded lessons were transcribed and analyzed using a socio-cultural discourse analysis approach. Focusing on the practices of one teacher (Teacher B), Probyn (2019) reported that Teacher B’s talk accounted for 53% in isiXhosa from which the teacher claimed that he “first build understanding in the learners’ home language and then transfer that understanding to English” (Probyn, 2019: 226). Probyn further described Teacher B’s method as “he would elicit a concept in isiXhosa and then get learners to express it in English; or when a learner was struggling to express herself in English, he told her to speak isiXhosa” (Probyn, 2019: 226). McKinney & Tyler (2019) corroborated Probyn’s (2019) findings when they investigated how pedagogical translanguaging and trans-semiotising can be used as strategies to disinvent and reconstitute ‘language’ for learning science. Using a linguistic ethnographic

case study, they observed the meaning making practices of 36 Grade 9 students in a natural science, on the topic of chemical reactions, in a public high school in a peri-urban (township) area of Cape Town. Speakers of isiXhosa and Afrikaans were represented in the class, and English as the language of teaching and learning. The language practices were gathered through video and audio recording. Reporting on the language practices of one of the students, Yonela, McKinney and Tyler (2019:149) noticed that “she draws on her knowledge of the Science register in isiXhosa to bring the scientific meaning of ‘isuntswana’ (a particle/a part) into her English translation”. In her earlier study, Probyn (2006: 403) found that “generally teachers tended to teach new concepts in Xhosa and then translate these into English”, after analysing four lessons each of six Grade 8 teachers’ language use in township schools in Grahamstown, in the Eastern Cape. In other words, the teachers in Grade 8 from the schools presented the content of the lesson in isiXhosa and used English to interpret. In a similar vein, Igboanusi (2008) examined the attitude of students, teachers, parents and administrators towards bilingual education in Nigeria, and observed that in Imo State schools in particular “a subject is sometimes taught in Igbo and explanations are given in English” (Igboanusi, 2008: 730). This meant that even if the content subject is in English, Igbo was used for introducing / presenting the topic, whereas English was used to annotate the meaning.

Although this literature illustrates the compartmentalization of languages in the classroom, the claim that the instructional discourses will be in the official classroom language and the explanatory discourses in the non-official classroom languages has not been proven.

5.5 Conclusion

In summary, when we say translanguaging or code switching is taking place in the classroom, we are not aware of the extent to which the learners who do not understand the official classroom language well are being short-changed. The implications of this clearly is that the children who understand the official classroom language well (in this case, English) will have the advantage of receiving the information in both the presentational segment and the majority, or close to majority, of the information in the explanatory segment. However, the children who do not understand English very well are being short-changed in both the presentational and in the explanatory segments. Although we expect that the explanatory segment should be the place where the low proficiency students of the official classroom language are supposed to gain the information, sometimes this may not be the case. The

expectation is that, even if the learners find the English materials (in the presentational discourse) difficult, the explanatory discourse should be the repetition and reinforcement of what has been said in a simpler form. The child who knows English is gaining the advantage of the information being repeated over and over again, while the learner who is strong only in the home language will have the information mentioned just once or twice. When he fails to gain the information, he will lose out.

5.5.1 Summary of the chapter

In this chapter, we have responded to our first and second objectives by giving empirical evidences on how FAL exists in multilingual classroom teacher-talk. What the study has further shown is that the claims of FAL is true with respect to presentational discourses. What our work has done with respect to FAL comprises of the following:

1. This chapter has provided quantitative data, and what is clear from this data is that in the presentational clauses, the non-official classroom languages are present to a certain extent.
2. The most interesting thing from the data (apart from the quantification) is that it allows us to know what people mean when they talk about mainly / only, and that our data formulated was a percentage mean between 80% or 90% and above.
3. As far as the explanatory discourses are concerned, FAL is problematic. For example, in terms of the overall language of the clauses in the explanatory discourses in our data, we found that English is dominating the frequency with a highest mean of 51.4%, compared to 35.8% in Hausa, and 13.4% in Fulfulde, whereas the mean of the language of terms in the explanatory discourses in English is 33.5% which actually competes with Hausa's mean of 40.6%. Likewise, in the encodings of knowledge, there is the dominance of English in the SD+ terms in the presentational clauses with a mean of 92.9%, while Hausa and English compete in the SD- terms.

CHAPTER 6: UNLOCKING KNOWLEDGE PATTERNS IN MULTILINGUAL TEACHER-TALK

6 Introduction

This chapter addresses two objectives of the study. The first objective is “to identify knowledge profiles which are observable in the flow of knowledge in the recorded lessons and to analyze how language use in multilingual teacher-talk maps onto these profiles”. This is objective 3 of the study, which identifies the overall patterns of knowledge profiles that occur over time across science and business studies transcripts and how languages mapped onto the knowledge profiles associated with each disciplines.

The second objective is “to investigate if there are differences in the composite language-knowledge profiles observed within and across science and business studies lessons, and to explain any such differences observed. This is objective 4 of the study, which is to discover whether there are differences between science and business studies as far as the composite language-knowledge profiles are concerned.

Data for the analysis will be drawn from both knowledge profiles and language-knowledge profiles of science and business studies lesson transcripts collected for the purposes of this research.

This chapter is divided into three main sections:

- i. Section one deals with objective 3 which is “to identify knowledge profiles which are observable in the flow of knowledge in the recorded lessons and to analyze how language use in multilingual teacher-talk maps onto these profiles”.
- ii. Section two deals with objective 4 – “to investigate if there are differences in the composite language-knowledge profiles and how they can be explained”, which seeks to answer the following question: “are there differences in the composite language-knowledge profiles observed, and how can they be explained?”
- iii. Section three discusses our findings.

6.1 Overview of knowledge profiles found in all the lessons

This section examines part of research objective 3, “to identify knowledge profiles that are observable in the flow of knowledge in the recorded lessons and to analyze how language use in multilingual teacher talk map onto these profiles”, which corresponds to research question

3: “what knowledge profiles are observable and how does language use in multilingual teacher-talk map onto these patterns?” The part that will be examined is “to identify knowledge profiles that are observable in the flow of knowledge in the recorded lessons”. This section is divided into four parts. Part 1 examines the overall patterns of knowledge profiles across transcripts, while part 2 focuses on the dominant patterns of knowledge profiles in science and business studies. In part 3, we explore the dominant patterns of knowledge profiles in the grade levels (between JSS1 and JSS3), and part 4 seeks to find out the dominant patterns of knowledge profiles in school types (between private and public schools).

To analyze research objective 3, the following hypotheses were developed:

Hypothesis i: Science should have more high semantic flatlines and semantic waves, and business should have more low semantic flatlines and semantic waves.

Hypothesis ii: JSS1 (Grade 7) should have more low semantic flatlines and semantic waves, and JSS3 (Grade 9) should have more high semantic flatlines and semantic waves.

Hypothesis iii: private schools should have more high semantic flatlines and semantic waves, and public schools should have low semantic flatlines and semantic waves.

For hypothesis 1, we predict that, because of the nature of science consisting of abstract terms and expressions, there is the likelihood that high semantic flatlines will dominate the teachers’ discourses, whereas the business studies lessons may likely consist of the day-to-day experiences of the students.

In hypothesis 2, as the JSS3 (Grade 9) students are in the last academic year of junior high school, we assume the teacher will over-use the high flatlines to prepare the learners for the senior secondary schooling. In the JSS1 (Grade 7), however, we expect the teacher may over-simplify the content considering that students have just been promoted from the primary schools.

In terms of hypothesis 3, we expect that, because teachers in private schools in Nigeria are well-trained and may have higher educational qualifications, they can easily balance the use of languages, whilst teachers in the public schools may consider the linguistic difficulties of the students, and tend to make the teaching easier to understand.

Table 6.1 presents the overall distribution of knowledge profiles across lesson transcripts

Transcripts	Semantic waves	Low semantic flatlines	High semantic flatlines	Downward shifts (Step down)	Upward shifts
Transcript 1 (JSS3 science, Private school)	7 (28.0%)	4 (16.0%)	10 (40.0%)	3 (12.0%)	1 (4.0%)
Transcript 2 (JSS3 science, private school)	7 (36.8%)	1 (5.3%)	8 (42.1%)	2 (10.5)	1 (5.3%)
Transcript 3 (JSS3 science, public school)	6 (30.0%)	7 (35%)	2 (10.0%)	4 (20.0%)	1 (5.0%)
Transcript 4 (JSS1 Business, public school)	4 (30.8%)	2 (15.4%)	1 (7.8%)	4 (30.8%)	2 (15.4%)
Transcript 5 (JSS1 Business, private school)	6 (33.3%)	6 (33.3%)	3 (16.7%)	0 (0%)	3 (16.7%)
Transcript 6 (JSS3 Business, private school)	10 (37.0%)	3 (11.1%)	8 (29.6%)	0 (0%)	6 (22.2%)
Transcript 7 (JSS1 science, private school)	7 (35.0%)	7 (35.0%)	4 (20.0%)	1 (5.0%)	1 (5.0%)
Transcript 8 (JSS1 science, public school)	5 (33.3%)	3 (20.0%)	2 (13.3%)	3 (20.0%)	2 (13.3%)
Total	52 semantic waves (33.0%)	33 low flatlines (21.4%)	38 high flatlines (22.4%)	17 downward shifts (9.8%)	17 upward shifts (8.6%)

Table 6.1 Knowledge profiles across science and business lessons

Table 6.1 above shows that the most dominant knowledge profiles that occur across our eight transcripts is the semantic waves with a mean of 33.0%, whereas the least dominant profile is upward semantic shifts, having an average of 8.6% of the total occurrences.

6.1.1 Semantic waves

Semantic waves is the process of modelling and weaving together different forms of knowledge within practices occurring between upward shifts and downward shifts (Maton, 2013; Macnaught, Maton, Martin & Matruglio, 2013). Table 6.1 also shows that the percentage range of the semantic waves occurring across the eight transcripts is 27.3% to 40.7% with a mean of 32.95% of the overall knowledge profiles. Figure 6.1 below presents an example:

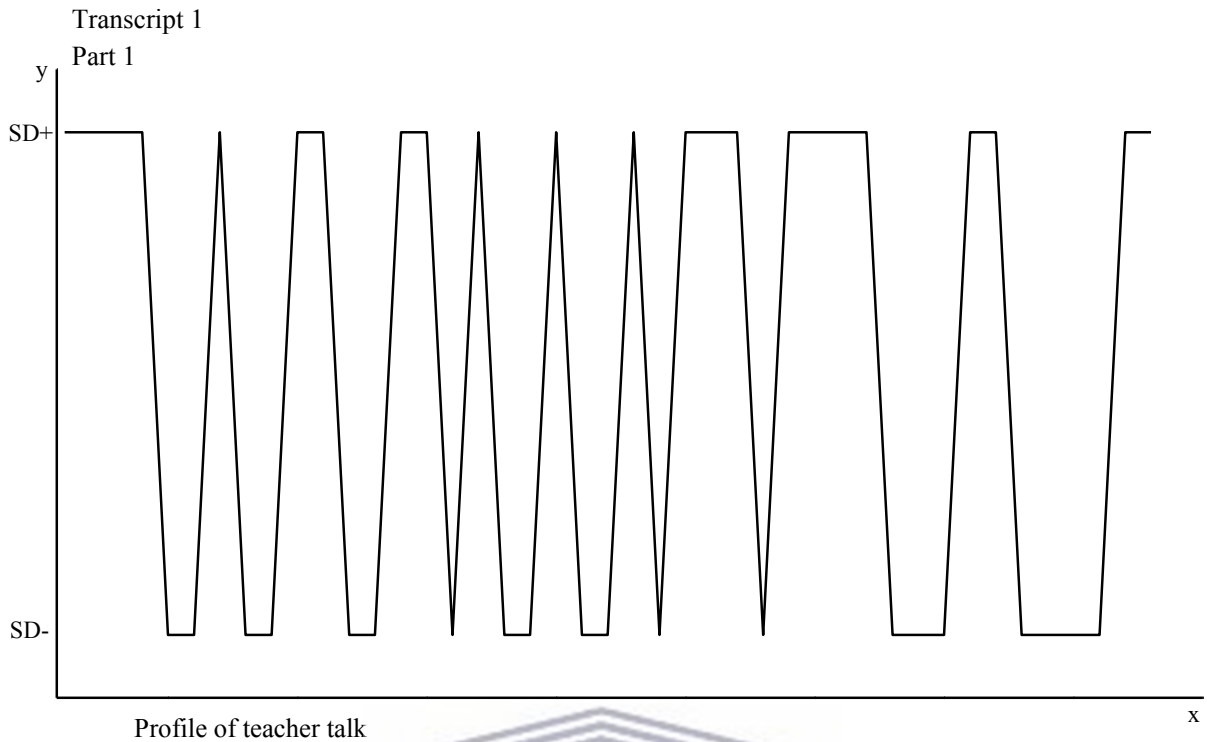


Figure 6.1 Profile of Teacher Talk along an Extended or Cumulative Semantic Wave

Figure 6.1 is a profile of JSS3 (Grade 9), a private school science lesson transcript on the topic ‘drug abuse’. The teacher presents the new topic of which the students have no understanding (SD+) and it requires a greater level of unpacking (SD-) using everyday language to weaken the semantic density. The teacher further repacks the term. In the process of repacking, new or the same concept (SD+) is being re-introduced. The process of moving up and down the semantic scale is referred to as semantic wave (Maton, 2013).

The text that corresponds to Figure 6.1 is as follows:

Turns	Analytical lines	Texts
Turn 1: Teacher	1	Teacher: We are going to explain drug abuse (SD+) today
	2	And... I know we have treated drug abuse (SD+) before in our other... we have treated drug abuse (SD+) before in the other class during our JSS1 revision class when.. and we just continue from there
	3	So the word abuse (SD+) actually means abnormal use of something, abnormal use of something (SD-).
	4	<i>So when you use ‘something out of its context of use (SD-), it is known as abuse (SD+).</i>
	5	<i>Idan kayi amfani da abu ba akan ka’ida ba ko hanya mafi dacewa ba, kayi kuskure (SD-) (Hausa for: If you use something not on instruction or not according to the right directions, you have abused it).</i>
	6	<i>So the use of drug out of its context (SD-) is what we called drug abuse (SD+).</i> Do you understand

Turn 3 Teacher	9	So, <u>drug</u> (SD+) in Hausa is called....
Turn 4: Students	10	(chorusing) <u>Magani</u> (SD-) (Hausa for: Medicine).
Turn 5: Teacher	11	<u>Magani</u> (SD-) (Hausa for: Medicine).
	12	If we want say to <u>drug abuse</u> (SD+) what do we say in Hausa?
	13	. [No answer: The teacher then says:] How do we say <u>drug abuse</u> (SD+) in Hausa? Hmmm?
	14	[Still no answer: The teacher then says:] <u>Shine amfani da magani ta hanyan da bai kamata ba</u> (SD-) (Hausa for: That is taking drugs in the way it is not supposed).
	15	In Fulani how do we call <u>drug</u> (SD+) in Fulani?
Turn 6: Student 2	16	<u>Lekki</u> (SD-)(Fulfulde for: Drugs).
Turn 7: Teacher	17	Teacher: (repeats) <u>Lekki</u> (SD-)(Fulfulde for: Drugs)
	18	So <u>drug abuse</u> (SD+) in Fulfulde is <u>Moodugo lekki saalitina</u> (SD-) (Fulfulde for: Consumption of drugs in excess).
	19	<u>Drug abuse is the use of drug in an abnormal way or in the way that is not supposed</u> (SD-).
	20	So, there are examples of <u>drugs</u> (SD+) that are being <u>abused</u> (SD+) or <u>hard drugs</u> (SD+) that people or hooligans use
	21	People who use these <u>drugs</u> (SD+) is in order to make themselves feel comfortable, get courage in order to do something funny or to wipe away their stress.
	22	Examples of <u>hard drugs</u> (SD+) are <u>cocaine</u> (SD+) <u>indian hemp</u> (SD+), <u>heroin</u> (SD+)
	23	Ko menene sunayen wa'yannan <u>kwayoyin</u> (SD-)? (Hausa for: So what are the names of hard drugs you know?).
Turn 8: student 3	24	<u>Student 3: Wiwi</u> (SD-) (Hausa for: Hemp).
Turn 9: Teacher	25	Daidai, <u>tabar wiwi</u> (SD-) (Hausa for: Correct. Indian hemp
	26	To menene <u>cocaine</u> (SD+)? (Hausa for: Okay, what is cocaine?)
	27	[No answer. Teacher then says:] Ana kiran <u>tabar iblis</u> (SD+). (Hausa for: It is called demon's cigarette).
	28	Akwai kuma <u>tabar sigari</u> (SD-) (Hausa: There is also cigarette)
	29	<u>Cigarette from Tobacco</u> (SD-).
Turn 10: student 4	30	<u>Fodiugo taba</u> (SD-) (Fulfulde for: Smoking)
Turn 11: Teacher	31	<u>Taba</u> (SD-) (Hausa for: Tobacco).
	32	These are examples of <u>drugs</u> (SD+) that are being <u>abused</u> (SD+)

Textbox 6.1 Excerpt from transcript 1, JSS3 (Grade 9) science in private school

The above text corresponds to the graph showing in Figure 6.1. In analytical line 1, the teacher starts the lesson by introducing the key concept of the lesson, 'drug abuse', which is an SD+ term. The teacher recalls in line 2 that this aspect of the topic has been encountered before. In lines 3, 4 and 5, the teacher focuses on 'abuse', one of the components of the

compound term ‘drug abuse’. She moves to unpack the concept ‘abuse’ in the form of a definition. For instance, line 4, “So when you use something out of its context of use (SD-), it is known as abuse (SD+)”, is being reformulated in line 5 as Idan kayi amfani da abu ba akan ka’ida ba ko hanya mafi dacewa ba, kayi kuskure (SD-) (Hausa for: If you use something not on instruction or not according to the right directions, you have abused it)”. The teacher re-introduces the term ‘drug abuse’ in line 6 as an SD+ term in the unpacking, which shifts the profile upward on the semantic scale. In line 9, the teacher then focuses on the term ‘drug’, another component of the compound term ‘drug abuse’ and seeks to verify the understanding of the students of the term ‘drug’ by asking them to provide the meaning in Fulfulde: “In Fulani how do we call drug (SD+) in Fulani?”. An unpacking of the term ‘drug’ is given in line 10, which the teacher reproduces in line 11: “Magani (SD-) (Hausa for: Medicine)”. In line 12 she pulls together the two terms as ‘drug abuse’ and further requests the students to provide the meaning of ‘drug abuse’ in Hausa: “If we want say to drug abuse (SD+) what do we say in Hausa”? This interrogation pushes / moves the term ‘drug abuse’ to the top of the semantic scale. The teacher continues in this direction of unpacking and repacking the terms up to the end of this segment of the lesson. This informed the extended semantic wave in this part of the lesson.

6.1.2 High density flatlines

Table 6.1 further indicates that the percentage range of high semantic flatlines across the eight transcripts is 9.1% to 42.1% with a mean of 21.8%. Maton (2013:8) refers to high semantic flatlines as the “movements of the knowledge profiles upwards and not downwards from the semantic scale which comprises of knowledge characterized by highly technical terms, expressions or symbols”. In addition, we consider a knowledge profile as being a high semantic flatline when the sequences of term-related information, as generated in the flow of teacher-talk, occurred more than three items and are SD+s. Figure 6.2 below provides an example:

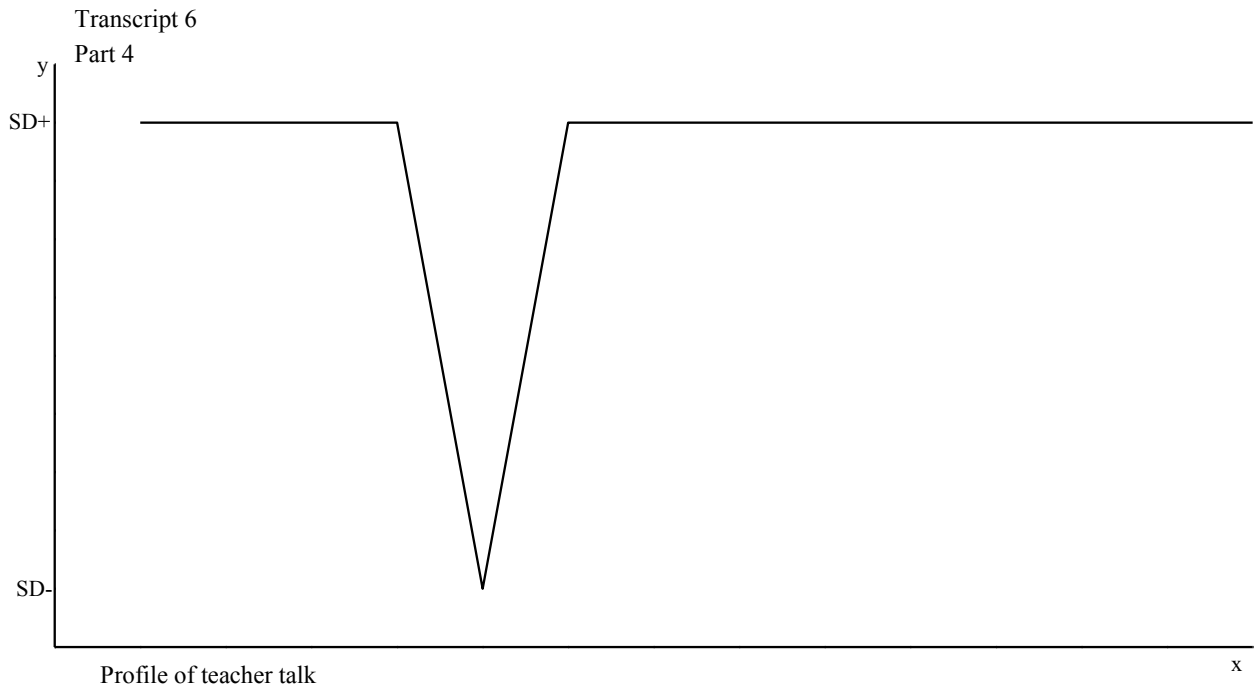


Figure 6.2 Profile of teacher talk on high semantic flatlines

Figure 6.2 is a profile comprising of two high semantic flatlines of JSS3 (Grade 9), a private school business studies lesson transcript on the topic ‘trading, profit and loss account’. The teacher traces the strengths of semantic density (SD+, SD-) from the top of the semantic continuum and continues to remain on the high levels without breaking down knowledge to the SD-, thereby creating a level of abstraction and complexity of information.

The text that corresponds to Figure 6.2 is:

Turns	Analytical lines	Transcripts/texts
Turn 50: Teacher	93	I am going to give you the <u>specimen</u> (SD+) okay? of the <u>trading and loss account</u> (SD+)
	94	What is a <u>specimen?</u> (SD+)
	95	No answer. Teacher then says:] That reminds me, have you done anything on <u>specimen?</u> (SD+)
		<u>Things that are used for practical in sciences are called...</u> (SD-)
Turn 51: Teacher & students	100	(chorusing answer) <u>Specimen</u> (SD+)
Turn 52: Teacher	101	<u>Specimen</u> (SD+) in the sciences.
	103	So what I am giving you a <u>specimen</u> (SD+) of <u>trading and loss account</u> (SD+) That is what we are going to use for our practical
	104	In the <u>specimen</u> (SD+) we have <u>naira</u> (SD+) signs ^c <u>₦</u> (SD+) or two naira signs ^d <u>₦₦</u> (SD+)

Textbox 6.2 Excerpt from transcript 6, JSS3 (Grade 9) business in private school

We establish a relationship between the text in Textbox 6.2 above and the graph in Figure 6.2. There are two high flatlines on the profile of Figure 6.2. The first sequence is from the beginning of this part of the profile, referred to as the semantic entry, while the second occurs at the end of the profile. Having extensively discussed the term ‘trading, profit and loss account’ in the previous parts of the lesson (parts 1, 2, and 3), the teacher now focuses on another concept in the lesson, the ‘specimen’ of ‘trading and loss account’ in analytical line 93, which is technical: “*I am going to give you the specimen (SD+) okay? of the trading and loss account (SD+)”.* She then seeks to verify the understanding of the students of the term ‘specimen’ in line 94 by asking, “*What is a specimen? (SD+)”.* In line 95, the teacher recalls that the learners are still in the junior high school preparing for the senior and have not encountered the term ‘specimen’. She then enumerates different items that she referred to as a specimen of trading and loss account in line 104: “*In the specimen (SD+) we have naira signs ₦ (SD+) or two naira signs ₦₦ (SD+)”.* These items are technical which inform the extended high flatline associated with this profile.

We will now look at the low semantic flatlines across the lesson transcripts.

6.1.3 Low density flatlines

Table 6.1 also showed that the percentage range of low semantic flatlines across the eight transcripts is 5.3% to 35.0% with an average of 21.3%. The low semantic flatlines are profiles that model meaning in a more explicit level, and involving the use of examples and everyday language for a long movement without repacking the information (Conana, Marshall & Case, 2016). Figure 6.3 below presents an example:

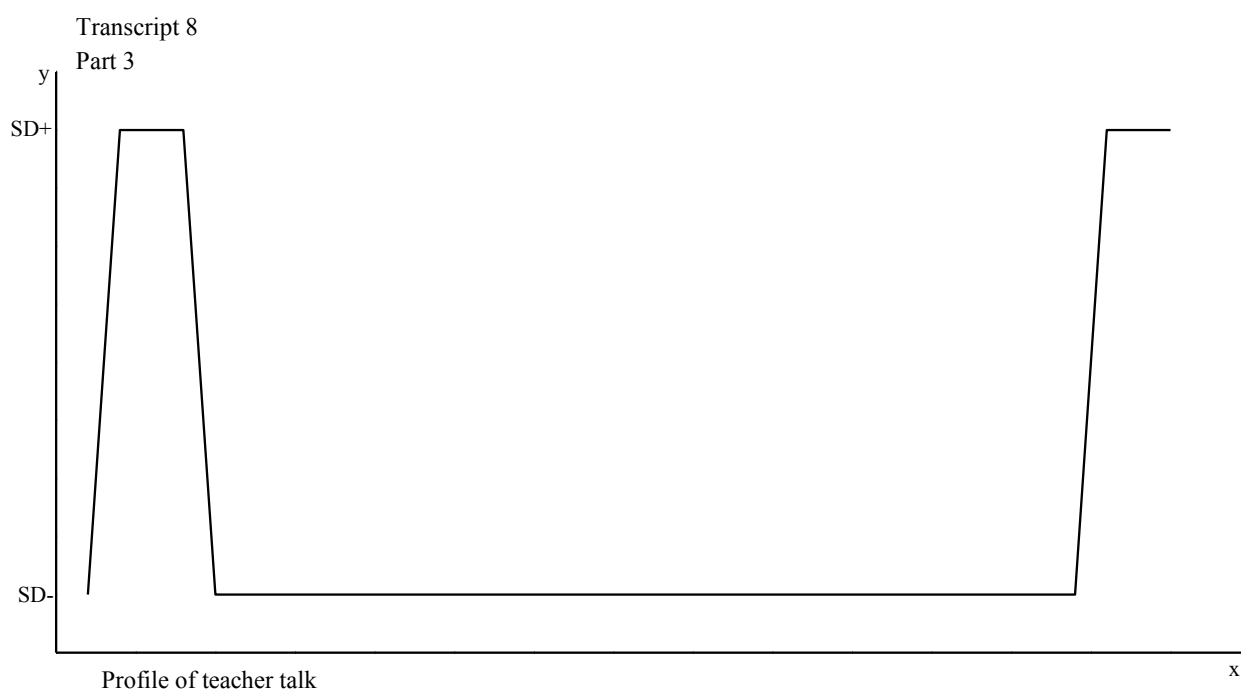


Figure 6.3 Profile of Teacher Talk on Low Semantic Flatlines

Figure 6.3 is a profile of the extended low flatline of the JSS1 (Grade 7) science lesson from a public school transcript on the topic: 'waterborne diseases'. The teacher unpacks the technical concept, 'waterborne diseases', through the use of a series of examples and elaboration adopting everyday languages of a knowledge that is weak in semantic density, without engaging with knowledge that is SD+.

The text that corresponds to Figure 6.3 is:

Turns	Analytical lines	Transcripts/texts
Turn 15: Teacher	36 & 37	<i>The sources of unclean water includes, rainwater when collected through the roof (SD+).</i> It contains little <i>impurity (SD+)</i> such as <i>CO₂ (SD+), N₂O₂ (SD+)</i> and <i>dust (SD-)</i>
	40	<i>Inda muke samu ruwan da babu kyau shine ruwan samanda muka tara, ruwan lambatu, ruwan kogi (SD-)</i> (Hausa for: Where we can get unclean water include rain water, water from the pond and stream/river water).
Turn 16: Students	41	(chorusing answer) <i>Ruwan rijiya (SD-)</i> (Hausa for: Well water).
Turn 17: Teacher	42	(repeats) <i>Ruwan rijiya (SD-), ko?</i> (Hausa: Well water, right?)
	43	<i>To, a inane muke samun ruwa mai kyau kuma?</i> (SD-) (Hausa for: Okay, where do we get clean water?)
	44	<i>Ha toi en hebata ndiyam bo eehh bod'dum?</i> (SD-) (Fulfulde for: Where do we eehh get clean water?) SD-.
Turn 18: Student 8	45	Ha <i>pampo</i> (SD-) (Fulfulde for: From the tap).
Turn 19: Teacher	46	(Repeat) Ha <i>pampo</i> (SD-) (Fulfulde for: From the tap)

Turn 20: Student 9	47	Ha <u>hosere</u> (Fulfulde for: From the spring) SD-.
Turn 21: Teacher	48 & 49	: Nonon, ha <u>hosere</u> (SD-) (Fulfulde for: It is, from the spring). To, ha toi en hebatta <u>ndiyam vo.. vodaka, bo?</u> (SD-) (Fulfulde for: Okay, where do we get unclean water, then?)
Turn 22: Student 1	50	Ha <u>wauru</u> (SD-) (Fulfulde for: From the well)
Turn 23: Teacher	51 – 53	Ha <u>wauru</u> (SD-), ha <u>mayo</u> (SD-). (Fulfulde for: From well, from river). <u>Inda muke samu ruwanda ba kyau</u> , ehh! (SD-) (Hausa for: Where we get unclean water, ehh!). <u>A ina inda muke samu ruwanda bakvau?</u> (SD-) (Hausa for: Where do we get unclean water?)
Turn 24: Student 8	54	A <u>rijiya</u> (SD-) (Hausa for: from well)
Turn 25: Teacher	55	(repeats) A <u>rijiya</u> (SD-) (Hausa for: From well)
Turn 26: Student 8	56	A <u>gwatta</u> (SD-) (Hausa for: From gutters)
Turn 27: Teacher	57	(repeats) A <u>gwatta</u> (SD-) (Hausa for: From gutters)
Student 6	58	A <u>dam</u> (SD-) (Hausa for: From the dam)
Turn 28: Teacher	59	: (repeats) A <u>dam</u> (SD-) (Hausa for: From the dam)
	60	Where do we get ^a <u>clean water</u> (SD
Turn 29 Student 10	61	A <u>pampo</u> (SD-) (Hausa for: From the tap)
Turn 30 Teacher	62 -66	<u>Tap water, ko?</u> (Hausa for: Tap water, right?) (SD-). <u>And spring ...</u> (SD-). <u>Water</u> (SD-). <u>Clean water</u> is <u>the one that is good for drinking and cooking</u> (SD-). It is <u>colourless</u> (SD+) without <u>taste</u> (SD+) or <u>odour</u> (SD+)

Textbox 6.3 Excerpt from transcript 8, JSS1 (Grade 7) science in public school

When we look at both the graph in Figure 6.3 and the text in Textbox 6.3, we notice that the content of the lesson correspondences to the graph of the profile. In analytical line 36, the teacher introduces this part of the lesson using a clause that does not contain technical terms: “The sources of unclean water includes, rainwater when collected through the roof (SD-)”. The teacher uses this clause as the basis for addressing subsequent information on ‘waterborne diseases’. Although the teacher moves to elaborate the term ‘unclean water’ in line 37, the elaboration comprises of more abstract terms and symbols which move the graph upward on the semantic scale: “It contains little impurity (SD+) such as CO₂ (SD+), N₂O₂ (SD+) and dust (SD-)”. Having stepped down the profile with the term, ‘dust’ (SD-), she maintains an extended low level of unpacking for a longer time in the lesson from analytical line 40 to line 65. This informs the long low flatline associated with this segment of the lesson. In line 66, she unpacks the term ‘clean water’. The unpacking involves SD+ terms, as seen in “It is colourless (SD+) without taste (SD+) or odour (SD+)”, which moves the profile upward on the scale.

In the next subsection, we address the downward shifts that occur in the overall data.

Turns	Analytical lines	Transcripts
Turn 1: Teacher	1	Our topic today is <u>light energy</u> . (SD+)
	2 – 6	All of you know what is <u>energy</u> ? (SD+). <u>Energy</u> (SD+) is what? [No answer: The teacher then says:] If I may ask, what is <u>energy</u> ? (SD+) Okay?
Turn 4: Student 1	7	<u>Karfi</u> (SD-) (Hausa for: Strength)
Turn 5: Teacher	8 – 10	(repeats) <u>Karfi</u> . (SD-)b (Hausa for: Strength). Amma anace dashi <u>kuzari</u> (SD-) (Hausa for: but it is called energy). in Fulfulde is <u>sembee</u> (SD-) (Fulfulde for: In Fulfulde is ‘energy’).
Turn 6: Students	11	(chorusing answer) <u>Sembee</u> (SD-) (Fulfulde: Energy)
Turn 7: Teacher	12 & 13	Now, let us see what is <u>light</u> . (SD+) What do you mean by <u>light</u> ? (SD+)
Turn 8: Student 2	15	<u>Haske</u> (SD-) (Hausa for: Light)
Turn 9: Teacher	16 & 17	Yes. <u>Haske</u> (SD-) (Hausa for: Light). In Fulfulde what is <u>haske</u> ? (SD-) (Hausa for: in Fulfulde what is ‘light’)
Turn 10: Student 3	18	<u>Njairi</u> (SD-) (Fulfulde: Light)
Turn 11: Teacher	19	<u>Njairi</u> (SD-), <u>njairi</u> (SD-) is light (Fulfulde for: Light, light is ‘light’)
	20	And in layman language <u>light</u> (SD+) can be said to be <u>brightness</u> (SD+)
	21 & 22	<u>Light</u> (SD+) in Hausa is <u>Haske</u> (SD-), in Fulfulde is <u>njairi</u> (SD-). And we say <u>energy</u> (SD+) in Hausa <u>kuzari</u> (SD-) and in Fulfulde is <u>sembee</u> (SD-).
	23 & 24	To join these two terms can mean <u>light energy</u> (SD+). Menene <u>light energy</u> ? (SD+)
Turn 12: Student 4	25	<u>Light energy</u> (SD+) can be said to <u>consist of two different forces light and energy for brightness sources of...</u> (SD-)
Turn 13: Teacher	26	I mean the meaning of <u>light energy</u> (SD+).
	27	<u>Light energy</u> (SD-) can be defined as <u>the ability or capacity of brightness of the light to do work</u> (SD-)
	28	<u>Because, light has some of its functions and that is why we are learning today</u> (SD-)

Textbox 6.4 Excerpt from transcript 3, JSS3 (Grade 9) science in public school

In analytical line 1, the teacher begins by introducing the lesson topic, ‘light energy’, which is a technical term. In order to make the learners understand the concept ‘light energy’ very well, the teacher focuses on one of the components of the topic, ‘energy’. In lines 2, 5 and 6, he requests the students to provide the meaning of the term ‘energy’: “All of you know what is energy? (SD+). Energy (SD+) is what? [No answer: **The teacher then says:**] If I may ask, what is energy? (SD+) Okay?” Having prompted the learners on the knowledge they already have about the term ‘energy’, the teacher then moves on to the term, ‘light’, which is the second component of the lesson topic, in analytical lines 12 and 13: “Now, let us see what is light (SD+). What do you mean by light? (SD+)”. The process allows for the modelling of different forms of knowledge profiles. The teacher shifts the strengths of semantic density from the top of the semantic scale in lines 24 and 25 as he combined the two

is what Maton (2015:326) refers in the 7-Gs as “semantic entry or going in” and the last is “semantic exit or going up”.

The text that corresponds to Figure 6.5 is:

Turns	Analytical lines	Transcripts
Turn 18: Teacher	30	So, the reason why we prepare a <u>trading account</u> (SD+) is for us to know our <u>gross profit</u> (SD+) at the end of the month or at the end of the year.
	31	<u>It depends on when you want to do what? When you want to close your account. Okay?</u> (SD-) So, write (The teacher write the notes on the board)
	34	A <u>trading account</u> (SD+), a <u>trading account</u> (SD+) is prepared... to determine.. a <u>gross profit</u> (SD+) and <u>loss account</u> to determine at the end of the of the month the <u>net profit</u> or the <u>net loss</u>
	35	Menene wannan <u>gross profit</u> (SD+) that will determine the <u>trading account?</u> (SD+) (Hausa for: What is this gross profit that will determine the trading account?)
	36	No answer. Teacher then says:] <u>Shine riba wanda dan kasuwa yasamu daga farin cinikinsa</u> (SD-) (Hausa for: It is the profit that businessman make at the beginning of a trading period)
	37 – 43	What is this <u>gross profit?</u> (SD+) (SD+) [No answer. Teacher then says:] A <u>gross profit</u> (SD+) is a <u>profit that is made at the beginning of the trading period, okay?</u> (SD-). <u>By then you have not earn any expenses</u> (SD-). <u>By then, you have not what? Incurred any expenses</u> (SD-). <u>Any profit you made at the beginning of your trading period is called what?</u> (SD-)
Turn 24: Teacher & Students	44	(chorusing answer) <u>Gross profit</u> (SD+)
Turn 25: Teacher	45	<u>By now you have not made any expenses out of the profit</u> (SD-) okay?
	46	That is what is called <u>profit and loss account</u> (SD+)
	47,48, 49	After your <u>trading account</u> (SD+) you get <u>gross profit</u> (SD+). <u>Gross profit</u> (SD+) shine ^b <u>ribanda dankasuwa yasamu kafin yayi wani sayyaya</u> SD-) (Hausa for: It is the profit that a businessman/woman made before any expenses). <u>This profit and loss account will now determine whether you make profit in that business or you made loss</u> (SD-)
	53	So we said the reason why we prepare <u>trading account</u> (SD+) in <u>accounting</u> (SD+) is to determine <u>gross profit</u> (SD+)

Textbox 6.5 Excerpt from transcript 6, JSS3 (Grade 9) business in private school

Textbox 6.5 reflects the graph shown in Figure 6.5. There are two sequences of upward semantic shifts on the graph. In the first sequence, in line 30, the teacher shifts the strengths of semantic density as she continues to unpack the concept, ‘trading, profit and loss account’ from the top of the semantic scale with a few SD+ terms: “So, the reason why we prepare a trading account (SD+) is for us to know our gross profit (SD+) at the end of the month or at the end of the year”. The SD+ terms are ‘trading account’ and ‘gross profit’. She then steps down to elaborate on the terms in line 31. In terms of the second sequence of the upward shift, and having conceptualized the subtopic of the lesson, the teacher concludes this segment of the lesson in line 53 by repacking the information to the top of the semantic scale.

She recapitulates the concepts earlier presented in analytical line 31: “So we said the reason why we prepare trading account (SD+) in accounting (SD+) is to determine gross profit (SD+)”. The following SD+ terms, ‘trading account’, ‘accounting’, and ‘gross profit’, which were utilized by the teacher at the end of this segment of the lesson, which shifted the profile upward on the semantic scale.

Given the overall patterns of knowledge profiles (in section 6.2 above) of this chapter, it is necessary to determine whether there are differences in the knowledge profile patterns that are linked to disciplines (science versus business), grade levels (JSS1 and JSS3), and school types (private schools and public schools).

6.1.6 To what extent are there differences in knowledge profiles in science and business lessons?

Table 6.1.1 summarises data of knowledge profiles across disciplines.

Knowledge profiles	Science	Business studies
Semantic waves	32.6%	33.7%
High semantic flatlines	25.1%	18.0%
Low semantic flatlines	22.3%	19.9%
Upward semantic shifts	6.5%	18.1%
Downward shifts/step down	13.5%	10.3%

Table 6.1. 1 Distributions of mean per knowledge profiles across disciplines

When we look at Table 6.1.1, we notice that it is only with two profiles that we identify striking differences between science and business studies. The two profiles are high semantic flatlines and upward shifts. Science is dominant in high semantic flatlines, whereas business is dominant in upward shifts. The mean of high semantic flatlines in science is 25.1% compared to the percentage mean of 18.0% in business. The gap of high semantic flatlines between science and business studies stands at 7.1%. For upward shifts, in business studies, there is a mean of 18.1%. When we compare that with the percentage mean of 6.5% of science, we have a gap of 11.6%. Table 6.1.1 also shows that there are glaring similarities between science and business studies on one of the other knowledge profiles: semantic

waves. For instance, the mean percentage of semantic waves in science is 33.4%, while the mean percentage of business is 32.2% with a difference of only 1.2%.

This finding confirms part of our research hypothesis 1, which states that: “science should have more high semantic flatlines and semantic waves, and business should have more low semantic waves and semantic waves”. The part that is in agreement with our results is the dominance of high semantic flatlines in science, while the part of the results that does not confirm our hypothesis is the dominance of upward shifts in business studies.

The dominance of high semantic flatlines in science could be the result of the way the science content is being taught by the teachers. It does not seem to fit into the reality of the day-to-day lives of the students (i.e. does not use the everyday language of the learners). We therefore do not know the differences of knowledge profiles in grade levels.

6.1.7 To what extent are there differences in knowledge profiles across level types?

Table 6.1.2 unravels the differences (if any) in the overall patterns of knowledge profiles between JSS3 (Grade 9) and JSS1 (Grade 7).

Table 6.1.2 below summarises data on knowledge profiles across grade levels.

Knowledge profiles	JSS1 (Grade 7)	JSS3 (Grade 9)
Semantic waves	31.1%	34.9%
High semantic flatlines	15.95%,	27.7%
Low semantic flatlines	25.5%,	17.2%
Upward shifts	14.5%	9.3%
downward shifts/step down	13.1%	10.95%

Table 6.1. 2 Distributions of mean per knowledge profiles across grade levels

Table 6.1.2 reveals that there are only two knowledge profiles that we distinguish between JSS1 (Grade 7) and JSS3 (Grade 9). The two knowledge profiles are high semantic flatlines and low semantic flatlines. The dominant profiles in JSS1 (Grade 7) are low semantic flatlines, whereas the dominant profiles in JSS3 (Grade 9) are high semantic flatlines. In identifying these striking differences, we notice that the mean of low semantic flatlines in JSS1 (Grade 7) is 25.5% compared to the mean of 17.2% in JSS3 (Grade 9). This gives a gap of 8.3%. With regard to high semantic flatlines, there is a maximum mean of 27.7% in JSS3

(Grade 9). When we compare this with the percentage mean of 15.95% of JSS1 (Grade 7), there is a gap of 11.8%. Table 6.1.2 also indicates a noticeable similarity between JSS1 (Grade 7) and JSS3 (Grade 9) on semantic waves. The mean of 34.9% of semantic waves is recorded in JSS3 (Grade 9) and a mean of 31.1% semantic waves is recorded in JSS1 (Grade 7). There is slight a margin of only 3.8%.

The results confirm our expectations of hypothesis 2 that “JSS1 (Grade 7) should have more low semantic flatlines and semantic waves and JSS3 (Grade 9) should have more high semantic flatlines and semantic waves”.

Given these results, it is possible that, because the students in JSS3 (Grade 9) will be moving to the senior class in the next academic year, the teacher may feel the need to balance the lessons by using a lot of movement on the semantic waves, whereas in the JSS1, the teacher may feel that, since the students are coming from the primary schools, there is need to stay on the low flatlines in order to prepare them for the challenges of junior high school teaching.

Next, we will look at the patterns of knowledge profiles in school types.

6.1.8 To what extent are the differences of knowledge profiles between private and public schools?

Table 6.1.3 examines data in relation to the differences in the dominant patterns of profiles in the public schools versus the overall dominant patterns of profiles in private schools.

Table 6.1.3 below summarises data on knowledge profiles across school types.

Knowledge profiles	Public schools	Private schools
Semantic waves	29.7%	34.9%
High semantic flatlines	12.2%	27.6%
Low semantic flatlines	23.8%	19.8%
Upward shifts	12.1%	11.7%
downward shifts/step down	22.1%	5.96%

Table 6.1. 3 Distributions of mean per knowledge profiles across school types

Table 6.1.3 shows that there are two profiles that indicate salient differences between public schools and private schools. The two knowledge profiles are high semantic flatlines, and downward shift/step down. The dominant profile in public schools is downward

shifts/step down, whereas the dominant profile in the private school is high semantic flatlines. Looking at the major differences, with respect to school types, we notice a maximum mean of 22.1% of downward shifts in public schools compared to a mean of 5.96% in the private schools, a huge gap of 16.1%. With regard to high semantic flatlines, the highest mean of 27.6% is recorded in private schools. When we compare this with the percentage mean of 12.2% of the public schools, we find a difference of 15.4%. Table 6.1.3 further reveals evidence of similarity between public schools and private schools on semantic waves. There is a mean of 34.9% across all private schools transcripts and a mean of 29.7% in public schools, given the fact that semantic waves dominate the two school types.

The results answer part of hypothesis 3 of the study: “private schools should have more high semantic flatlines and semantic waves, and public schools should have more low semantic flatlines and semantic waves”. The part of the results that correspond to our hypothesis is the fact that private schools are dominant in high semantic flatlines and semantic waves. Conversely, the part of the results that does not correspond to our hypothesis is the dominance of downward shifts in public schools.

As a result of the findings, one is compelled to say that it is possible teachers in private schools in Nigeria may be better trained, with Bachelors or Master’s degrees or other relevant teaching qualifications. Teachers in private schools are aware of the need to balance the use of language in order to explain the content using simpler language. On the other hand, in the public schools where downward semantic shifts dominate, it is possible that the teachers are aware of the linguistic difficulties of the students, because “public schools have more students with limited English proficiency” (National Centre for education statistics, US, 1997:8), and over-simplify the information, believing that the students do not understand the content.

6.2 How does language use map onto the knowledge profiles?

This subsection scrutinizes part of objective 3: “to identify knowledge profiles which are observable in the flow of knowledge in the recorded lessons and to analyze how language use in multilingual teacher-talk maps onto these profiles”. The part that will be examined is, “to analyze how language use in multilingual teacher-talk maps onto these profiles”, which answers part of research question 3, “how does language use in multilingual teacher-talk map onto these patterns?”

Data for analyzing this part of the chapter is drawn from profiles in which languages are superimposed. The idea here is to map languages onto the knowledge profiles.

This subsection deals mainly with the presentation of the overall patterns of multilingual knowledge profiles across the all the lessons.

This study is not just about knowledge profiles. The problem we started with (in chapters 1 and 2) was that a large body of literature has been written about multilingual teacher-talk without really looking at the knowledge basis (e.g. Seidlitz, 2003; Tian, 2009). Given the overall knowledge profiles, we want to find out whether the official classroom language is really used for the presentational discourses and the non-official classroom languages are used for explanatory discourses. In order to achieve this, we turned to the categories of multilingual information from linguistic landscapes (Reh, 2004) that we presented in the methodology chapter in relation to knowledge profiles. In the subsequent sections, we will present how language use is superimposed on the knowledge profiles.

6.2.1 To what extent is the information provided in one language repeated in another language?

In order to answer this question, we analyzed our language profiles using sequences as language boundaries. A sequence is a set of related items that follow each other in a particular order. A sequence in this context is a pair of language boundaries on the language profiles. We utilized what is before and what is after the multilingual profile boundaries. The next subsection addresses multilingual semantic waves that occurred in the overall transcripts.

6.2.1.1 What are the multilingual semantic waves that occur across transcripts?

In the sequences of semantic waves, we looked at how multilingual profiles mapped onto the knowledge profiles.

Table 6.1.4 below summarises data on semantic waves across multilingual knowledge profiles.

Semantic waves (50 instances)	
Multilingual profiles	Total: 83 sequences
Duplicating multilingualism	40 (48.2%) sequences
Complementary multilingualism	25 (30.1%) sequences
Fragmentary multilingualism	16 (19.3%) sequences
Overlapping multilingualism	10 (12.0%) sequences

Table 6.1. 4 Distributions of semantic waves per multilingual profiles across transcripts

When we look at Table 6.1.4, the dominant multilingual profile of semantic waves across the eight transcripts is duplicating multilingualism with a mean of 48.2%, while the least dominant multilingual profile is overlapping multilingualism with a mean of 12.0%. Figure 6.6 provides an example:

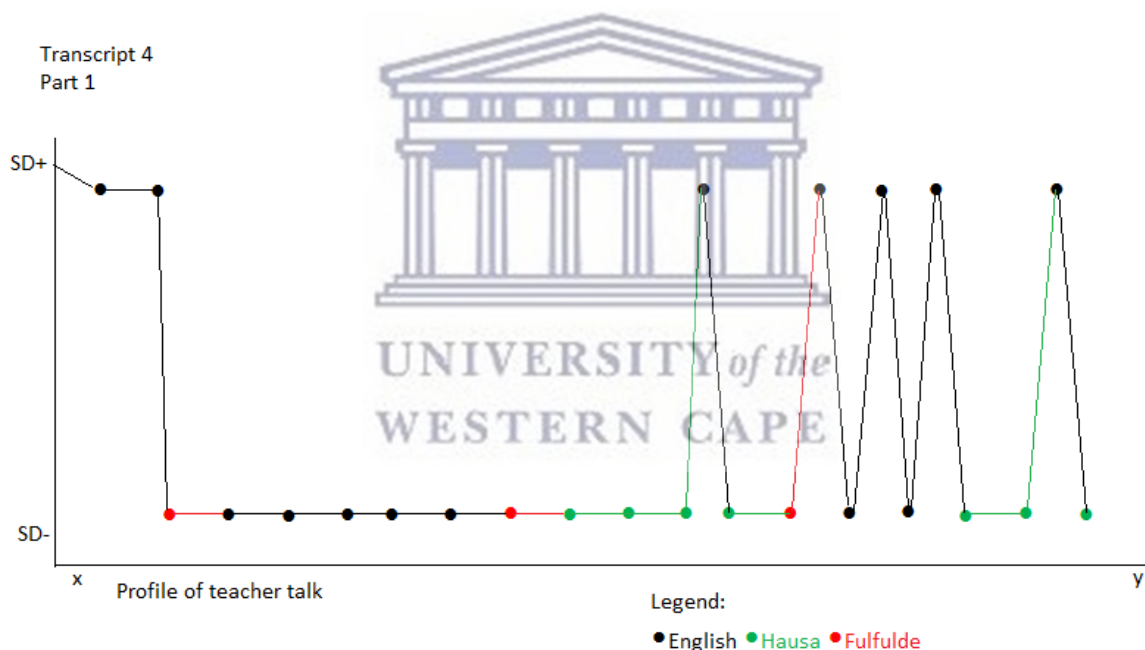


Figure 6.6 multilingual profile of teacher talk revealing semantic wave

Figure 6.6 is a multilingual knowledge profile of semantic waves in JSS1 (Grade 7), a public school business studies lesson transcript on the topic ‘occupation’. The teacher introduced the new topic and its meanings required some level of unpacking (SD+). He then proceeded to unpack this concept of ‘occupation’ by weakening the semantic density (SD-), using three languages known to the learners. After an extended low fatline, the teacher maintains the balance of repacking and unpacking the information using the shifts on the strengths of semantic density (SD+, SD-) from the unfolding practices in the lesson. The

transition between these different knowledge types is what Maton (2013:14) referred to as a “semantic wave”.

The text that corresponds to Figure 6.6 is:

Turns	Analytical lines	Transcripts
Turn 1: Teacher	1 & 2	I told you we are coming to have a special class with you and that is about ahh, occupation (SD+) We are going to consider the topic occupation (SD+)
	3	kuggaal (SD-) (Fulfulde for: Work)
	4 – 8	<i>Before I go on to my lesson, ahh you must have seen people doing different kinds of job or work. (SD-). If you go in the streets, you will see some people are driving they are drivers, and the policemen on the way (SD-). You will also see people that are selling meat by the roadside (SD-). Sometimes you will see people dress in white, we call them nurses, some doctors (SD-). Some people by the roadside are doing metal work or welding, some constructing seats with woods (SD-)</i>
	9	<i>kuggaal himbe wadata nder wuro bana kafintaji, vointugo mota, ko mallam yahi makaranta jankina bikkoi. Part kugaal</i> (SD-) (Fulfulde for: The work which people do in town like carpentry, repairing of vehicles or a teacher teaching in school. All is work).
	10 -12	<i>Kuna iya ganin irrin wadan nan mutane akan hanyonyi da tituna yavin da kuke zagayawa a cikin gari</i> (SD-) (Hausa for: You have been seeing these types of people on our roads and streets as you move around in town.). <i>Wa'yansu suna sharar lambatu, ko gyaran mota</i> (SD-) (Hausa for: Some are sweeping the roads/gutters or repairing vehicles). <i>Akwai likitoci, drehabin motocin kasuwa da ma 'yan dokka. Akwai kuma ma'aikatan gonnati. ko?</i> (SD-) (Hausa for: There are medical doctors, commercial drivers and police. There are also civil servants, right?)
	14	These are what we called occupation (SD+)
	15 & 16	aiki (SD-) (Hausa for: occupation). kuggaal (SD-) (Fulfulde for: Work)
	17 & 18	If we say occupation (SD+) we mean <i>the work which people do to earn a living, whether the work is temporary or permanent. Occupation</i> (SD+) is defined as <i>trade, business which occupies ones time either permanently or temporally and through which one earns his/her living</i> (SD-).
	21	This is what we mean by occupation (SD+)
	22	<i>Abinda nake fadi anan shine, menene occupation da misalin da na baku?</i> (SD-) (Hausa: What I am saying is that, what is ‘occupation’ with the examples I have given you?)
Turn 6: Student 1	23	Sana'a (SD-) (Hausa for: profession)
Turn 7: Teacher	24	Correct. Occupation (SD+) means sana'a (SD-) (Hausa for: ‘Correct. Occupation means’ profession)

Textbox 6.6 Excerpt from transcript 4, JSS1 (Grade 7) business in public school

In Textbox 6.6, the teacher introduces the lesson topic ‘occupation’ in analytical lines 1 and 2 in English, the official classroom language. He then provides the Fulfulde term “**kuggaal** (SD-) (Fulfulde for: Work)” as an equivalent of the term ‘occupation’, which is duplicating multilingualism. The teacher maintains the low level of unpacking by contextualizing the concept using both the official and non-official classroom languages. Given the long unpacking, he summarizes this part of the lesson in line 14 by re-introducing

the term ‘occupation’ as seen in “These are what we called ***occupation*** (SD+)”. The teacher further steps down in line 15 using a Hausa equivalent, “***iki*** (SD-) (Hausa for: occupation)”, which is duplicating multilingualism / bilingual, and a Fulfulde equivalent in line 16, “***kuggaal*** (SD-) (Fulfulde for: Work)”, a duplicating multilingualism / trilingual. In lines 17 and 18, the teacher uses English to repack the term ‘occupation’ and proceeds to provide the relation of equivalence in the form of a definition, which weakened the multilingual knowledge to down the scale. He then summarises this part of the lesson in English by re-introducing the concept ‘occupation’ in line 21: “*This is what we mean by ***occupation*** (SD+)*”, moving the multilingual profile upward on the semantic scale. The teacher steps down again in line 22, requesting the students to give the meaning of ‘occupation’ using a Hausa clause: “***Abinda nake fadi anan shine, menene occupation da misalin da na baku?*** (SD-) (Hausa: *What I am saying is that, what is ‘occupation’ with the examples I have given you?*)”, a fragmentary multilingual content. Having received the required answer from one of the learners in Hausa (SD-), the teacher mentions the concept ‘occupation’ and re-expresses the learner’s answer, which is a Hausa term, ‘sana’a’, as seen in in line 24: “*Correct. Occupation (SD+) means ***sana’a*** (SD-) (Hausa for: ‘Correct. Occupation means profession)*”, which brings down the profile to SD- as duplicating multilingualism / bilingual. The process informs the multilingual semantic wave provided in Figure 6.6.

Having addressed how multilingual knowledge profiles map onto semantic waves, we want to know how multilingual profiles mapped onto high semantic flatlines.

6.2.1.2 What are the multilingual high flatlines that occur across transcripts?

Table 6.1.5 summarises data on high flatlines across multilingual knowledge profiles.

High semantic flatlines (34 instances)	
Multilingual profiles	Total: 9 sequences
Duplicating multilingualism	1 (11.1%) sequence
Complementary multilingualism	1 (11.1%) sequence
Fragmentary multilingualism	7 (77.8%) sequences
Overlapping multilingualism	0 (0.0%) sequences

Table 6.1. 5 Distributions of high flatlines per multilingual profiles across transcripts

Table 6.1.5 shows that the highest multilingual profiles in high semantic flatlines across the eight transcripts is fragmentary multilingualism with an average of 77.8% of the profiles,

whereas the multilingual profiles with the lowest percentage is overlapping multilingualism, with a mean of 0.0% occurrences. Figure 6.7 presents an example:

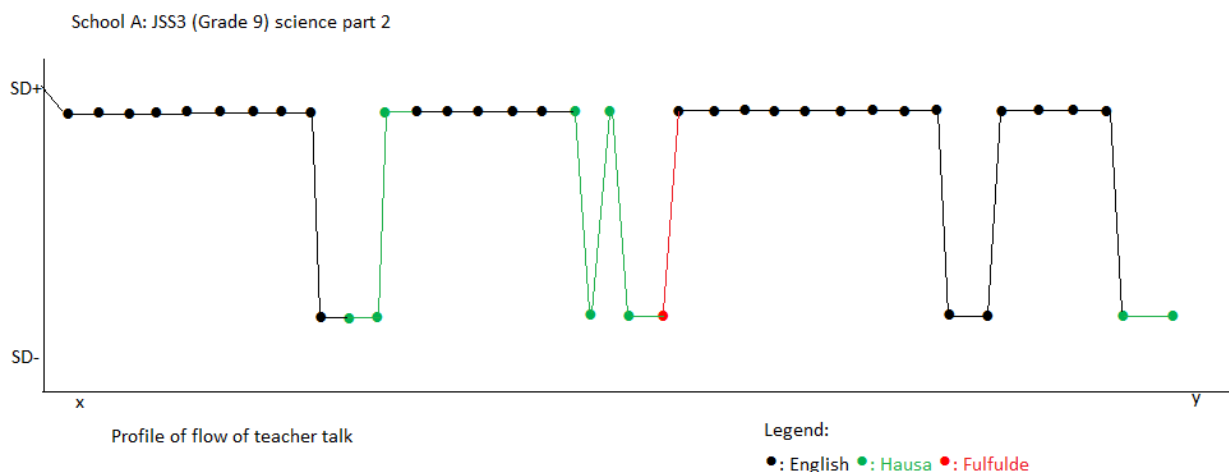


Figure 6.7 Multilingual profile of high semantic flatlines

Figure 6.7 is a multilingual profile of high semantic flatlines of JSS3 (Grade 9), a private school science lesson transcript on the topic ‘compound’. The teacher models the strengths of semantic density (SD+, SD-) by repackaging the information using multiple languages from the semantic scale. The teacher maintains an “abstract discussion of condensed concepts that engage little with empirical data” (Maton, 2013: 18). This means that the teacher remains at the high level of introduction of knowledge that is strong in semantic density (SD+), without unpacking using everyday language.

The text that corresponds to Figure 6.7 is:

Turns	Analytical lines	Transcripts
Turn 1: Teacher (cont'd)	22	Let us discuss <u>compound properties</u> (SD+)
	23	The relative <u>proportion</u> (SD+) of the <u>element</u> (SD+) in a <u>compound</u> (SD+) is <u>fixed</u> (SD+)
	24	For example, two <u>atoms</u> (SD+) of <u>hydrogen</u> (SD+) combine with one <u>atom</u> (SD+) of <u>oxygen</u> (SD+) to give us <u>water</u> (SD-)
	25	Ko ina kadibi <u>ruwa</u> (SD-) yana da <u>sinadarin</u> (SD-) <u>H₂O</u> (SD+) (Hausa: Wherever you fetch some water, the quantity contains the elements of H ₂ O)
	26	Another property is, the components of a <u>compound</u> (SD+) will not retain their individual <u>properties</u> (SD+).
	27	For instance, <u>sodium</u> (SD+) and <u>chlorine</u> (SD+) existing separately are <u>poisonous</u> (SD+)
	28	Menene <u>poison</u> ? (SD+) (Hausa for: What is poison?)

Turn 2: Student 1	29	<u>Magani</u> (SD-) (Hausa for: Drugs)
Turn 3: Teacher	30 & 31	<u>Poison</u> (SD+) shine <u>guba</u> (SD-) (Hausa for: ‘Poison’ means poison). <u>Ko tooke</u> (SD-) in fulfulde (Fulfulde: Poison)
	32	But if they are combined together they are not <u>poisonous</u> (SD+)
	33	A <u>compound</u> (SD+) has distinct set of <u>properties</u> (SD+) which do not resemble the <u>properties</u> (SD+) of its constituent <u>elements</u> (SD+)
	34	For instance, <u>hydrogen</u> (SD+) is a <u>gas</u> (SD+), <u>oxygen</u> (SD+) is a <u>gas</u> (SD+) but when they are combined they give <u>water</u> (SD+) which is <u>liquid</u> (SD-). The original <u>properties</u> (SD+) have been altered
	35	Also, the <u>mechanical</u> (SD+) separation of <u>elements</u> (SD+) of a <u>compound</u> (SD+) is impossible
	36	Baza’ a iya raba <u>Sinadarin</u> (SD-) da <u>hanu</u> (SD-) ba (Hausa for: One cannot separate compounds using the hands.

Textbox 6.7 Excerpt from transcript 2, JSS3 (Grade 9) science private school

The above extract indicates a relationship between Figure 6.7 and the contents of the lesson. In analytical line 22, the teacher proceeds to introduce a new concept ‘compound properties’ as indicated in: “Let us discuss **compound properties** (SD+)”. Having maintained a high level of talk with several SD+ in English, the official classroom language, in analytical lines 22 through 24 the teacher briefly unpacked the lesson using both the official and non-official classroom languages. In line 25, during the unpacking, she repacks the term ‘ruwa’, a Hausa term for H₂O, as in “Ko ina kadibi **ruwa** (SD-) yana da **sinadarin** (SD-) **H₂O** (SD+) (Hausa for: Wherever you fetch some water, there are elements of H₂O). The symbol ‘H₂O’, which is an SD+ term in Hausa, appearing on the second part of the high semantic flatlines, is a complementary multilingual. As the teacher continues in English to elaborate on the concept ‘compound properties’ in line 26 and 27, on the aspect that “the components of a **compound** (SD+) will not retain their individual **properties** (SD+)”, she provides an example of ‘sodium’ and ‘chlorine’ which are separately toxic, in line 27. Given the toxicity of ‘sodium’ and ‘chlorine’ which are harmful separately, the teacher then changes language and asks in Hausa in line 28, “Menene **poison**? (SD+) (Hausa for: What is poison?)”. This question posed as a fragmentary multilingual statement on a multilingual high flatline.

Given the kind of multilingual high flatline in Figure 6.7, it is worth finding out the kinds of multilingual knowledge profiles that occurred in low semantic flatlines in the lesson transcripts.

6.2.1.3 What are the multilingual low flatlines that occur across transcripts?

Table 6.1.6 below summarises data on low flatlines across multilingual knowledge profiles.

Low semantic flatlines (31 instances)	
Multilingual profiles	Total: 76 sequences
Duplicating multilingualism	28 (36.8%) sequences
Complementary multilingualism	31 (40.8%) sequences
Fragmentary multilingualism	9 (11.8%) sequences
Overlapping multilingualism	8 (10.5%) sequences

Table 6.1. 6 Distributions of low flatlines per multilingual profiles across transcripts

Table 6.1.6 shows that complementary multilingualism is the dominant multilingual profile that is associated with low semantic flatlines, accounting for a mean of 40.8%, whilst the lowest multilingual profile is overlapping multilingualism, with an average of 10.5% of occurrences. Figure 6.8 provides example:

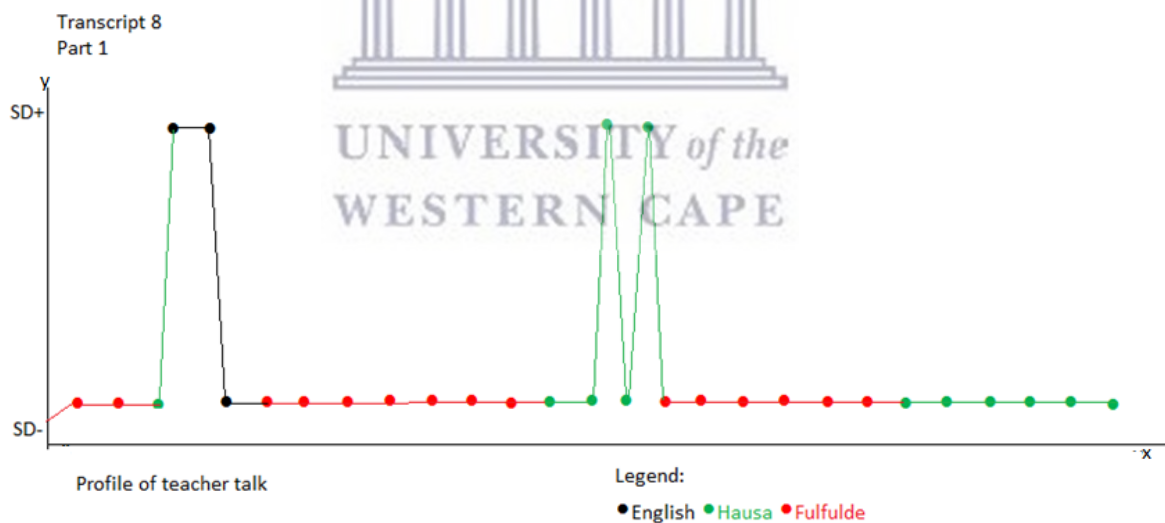


Figure 6.8 Multilingual Profile of Low Flatlines

Figure 6.8 depicts multilingual low flatlines of JSS1 (Grade 7), in a public school science lesson on the topic ‘waterborne diseases’. Figure 6.8 shows how the teacher models the strengths of semantic density (SD+, SD-) by simplifying the information using multiple languages that is SD- and maintains low-level talk using everyday language on the semantic

scale. The majority of the unpacking is done in the learners' main languages without engaging with knowledge that is stronger in semantic density SD+. The text that corresponds to Figure 6.8 is:

Turns	Analytical lines	Transcripts/texts
Turn 1: Teacher	1	Hande min laarai <u>nyauji</u> (SD-) 'yen heebata ha ^b <u>ndiyam voodaaka</u> (SD-) (Fulfulde for: Today we are going to look at the diseases that can be contacted through unclean water).
	2	<u>Yau zamu dubi ciuttukanda ake samuwa ta ruwanda ba kyau, ko?</u> (SD-) (Hausa for: Today we are going to look at diseases which can be contacted through unclean water, okay)
Turn 2: Teacher	4,5	<u>Water borne diseases</u> (SD+). <u>Water borne diseases</u> (SD+) are <u>diseases that are transmitted by water</u> (SD-)
	6	Irin, irin eeehh <u>nyau</u> (SD-) toi 'yen heebata ha <u>ndiyam voodaaka?</u> (SD-) (Fulfulde for: What, what eeehh are the diseases that we can contact from drinking unclean water?) You!
Turn 3 Student 1	7	<u>Babboji</u> (SD-) (Fulfulde for: Typhoid)
Turn 4: Student 2	8	<u>Ture</u> (SD-) (Fulfulde for: Vomiting)
Turn 5	9	(repeats) <u>Ture</u> (SD-) (Fulfulde for: Vomiting)
Turn 6: Student 3	10	<u>Rewre</u> (SD-) (Fulfulde for: Stooling)
Turn 7: Teacher	11	<u>Ture be rewre</u> (SD-) en heebata ha ^b <u>ndiyam voodaaka</u> ko? (SD-) (Fulfulde for: Cholera can be contacted from drinking unclean water, right?)
Turn 9: Teacher	13	<u>Cuttukanda</u> (SD-) ake samu ta <u>ruwanda ba kyau</u> (SD-) sune, <u>Typhoid</u> (SD+), <u>ahhh, da Ammai da gudawa</u> (SD-), da da daaa da <u>Cholera</u> (SD+), ko? (Hausa for: Diseases that can be contacted through unclean water are typhoid, vomiting and stooling, right?)
Turn 10: Teacher	15	<u>Ha toi en heebata ndiyam voodaaka?</u> (SD-) (Fulfulde for: where do we get unclean water?)
Turn 11: Student 4	16	Ha <u>mayo</u> (SD-) (Fulfulde for: From the river)
Turn 12: Teacher	17	Nonon, ha <u>mayo</u> (SD-) (Fulfulde for: Yes, from river)
Turn 13: Student 5	18	<u>Wauru</u> (SD-) (Fulfulde for: The well)
Turn 14: Teacher	19	<u>Be wauru,</u> (SD-) <u>be ndiyam yeinde</u> (SD-) (Fulfulde for: And the well and rain water)
	20	<u>A ina inda muke samu ruwanda ba kyau, kuma?</u> (SD-) (Hausa for: Where do we get unclean water, also?)
Turn 15: Student 6	21	A <u>kogi</u> (SD-) (Hausa for: From the river)
Turn 16: Teacher	22	Daidai ne, a <u>kogi</u> (SD-) (Hausa for: It is correct, from the river)
Turn 17: Teacher & students)	23	(joint construction) A <u>rjiya</u> (SD-) (Hausa for: From the well)
Turn 18: Teacher	24	Da kuma <u>lambattu,</u> (SD-) ko? (Hausa for: And also in the gutters, right?)

Textbox 6.8 Excerpt from transcript 8, JSS1 (Grade 7) science public school

The extract in Textbox 6.8 reflects the items on the graph in Figure 6.8. There are two sequences of low flatlines on this graph. The first low flatline occurs after the teacher has

introduced the topic. For instance, in analytical line 1, the teacher introduces the topic using a Fulfulde clause: “Hande min laarai nyauji (SD-) ‘yen heebata ha ndiyam voodaaka (SD-) (Fulfulde for: Today we are going to look at the diseases that can be contacted through unclean water)”. He reformulates the Fulfulde information in Hausa: “Yau zamu dubi cituttukanda ake samuwa ta ruwanda ba kyau, ko? (SD-) (Hausa for: Today we are going to look at diseases which can be contacted through unclean water, okay)”, which are both complementary multilingualism to the packed English phrase, “Water borne diseases (SD+)” in analytical line 4. Having introduced the topic in line 5, the teacher provides the relation of equivalence of the term ‘waterborne disease’ in an English clause, which brings down the knowledge to SD-. She proceeds in line 6 to ask the students in Fulfulde to provide examples of diseases that can be contacted through impure water: “Irin, irin eeehh nyau (SD-) *toi ‘yen heebata ha ndiyam voodaaka? (SD-) (Fulfulde for: What, what eeehh are the diseases that we can contact from drinking unclean water?)*”, which is an overlapping multilingualism. From analytical line 11, the teacher engages the students in Fulfulde in finding examples of waterborne diseases, which are examples of complementary multilingualism. It also provides a long engagement with weaker knowledge of SD-.

Before the second low flatline, we also noticed the instances of fragmentary multilingualism in line 13 where the teacher uses a Hausa clause comprised of technical terms to repack the Fulfulde terms seen in the previously lines: “Cututtukanda (SD-) *ake samuwa ta ruwanda ba kyau (SD-) sune, Typhoid (SD+), ahhh, da Ammai da gudawa (SD-) da da daaa da Cholera (SD+), ko?* (Hausa for: Diseases that can be contacted through unclean water are typhoid, vomiting and stooling, right?)”. Having repacked the information, in line 15, the teacher switches languages to elaborate on the topic ‘waterborne diseases’. She uses a simple Fulfulde clause to request the students to provide places where impure water can be found, which falls under complementary multilingualism / trilingual: “Ha toi en heebata ndiyam voodaaka? (SD-) (Fulfulde for: where do we get unclean water?)” This process also engages both the teacher and the students using simple Fulfulde terms to produce necessary examples, from analytical lines 15 to 19. The teacher switches languages in line 20 again by inviting the students to provide sources of impure water, and uses an easy-to-understand Hausa clause to restate the Fulfulde information in line 15: “A ina inda muke samu ruwanda ba kyau, kuma? (SD-) (Hausa for: Where do we get unclean water, also?)”. In analytical lines 21 to 24, the teacher provides simplistic information on ‘impure water’, which is complementary multilingualism / bilingual.

With the analysis of multilingual low semantic flatlines, we are not aware of the patterns of multilingual knowledge profiles in downward semantic shifts.

6.2.1.4 What are the multilingual downward shifts that occur across transcripts?

Table 6.1.7 summarises data on downward shifts across multilingual knowledge profiles.

Downward semantic shifts (16 instances)	
Multilingual knowledge profiles	Total: 12 sequences
Duplicating multilingualism	2 (16.7%) sequences
Complementary multilingualism	3 (25.0%) sequences
Fragmentary multilingualism	2 (16.7%) sequences
Overlapping multilingualism	5 (41.7%) sequences

Table 6.1. 7 Distributions of downward shifts in multilingual profiles

Looking at Table 6.1.7, we observed that the dominant multilingual profiles that occurred in downward semantic shifts is the overlapping multilingualism with a mean of 41.7%, whereas the lowest multilingual profiles are duplicating multilingualism, with a mean of 16.7%, and fragmentary multilingualism, with an average of 16.7% as well. Figure 6.9 provides an example:

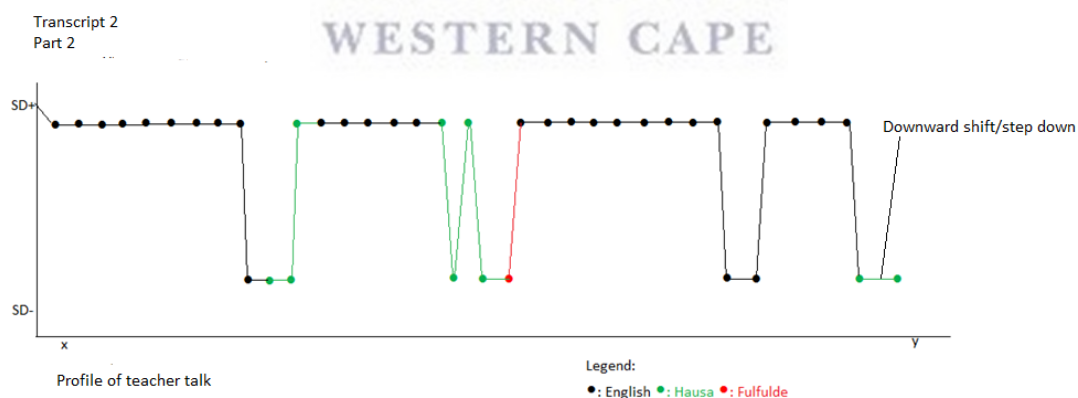


Figure 6.9 Multilingual Profile Showing Downward Shift

Figure 6.9 is a multilingual profile comprising of a downward shift in JSS3 (Grade 9), a private school science lesson transcript on the topic ‘compound’. This multilingual downward shift occurs from the unfolding practices of the teacher who traces the strengths of semantic density (SD+, SD-) between three high flatlines and semantic waves and finally breaks down

the items to a weaker knowledge of SD- to simplify, using multiple languages without repacking back to the top of the semantic scale.

The text that corresponds to Figure 6.9 is:

Turns	Analytical lines	Transcripts
Turn 1: Teacher (cont'd)	22	Let us discuss <u>compound properties</u> (SD+)
	23	The relative <u>proportion</u> (SD+) of the <u>element</u> (SD+) in a <u>compound</u> (SD+) is <u>fixed</u> (SD+)
	24	For example, two <u>atoms</u> (SD+) of <u>hydrogen</u> (SD+) combine with one <u>atom</u> (SD+) of <u>oxygen</u> (SD+) to give us <u>water</u> (SD-)
	25	Ko ina kadibi <u>ruwa</u> (SD-) yana da <u>sinadarin</u> (SD-) <u>H₂O</u> (SD+) (Hausa: Wherever you fetch some water, the quantity contains the elements of H ₂ O)
	26	Another property is, the components of a <u>compound</u> (SD+) will not retain their individual <u>properties</u> (SD+).
	27	For instance, <u>sodium</u> (SD+) and <u>chlorine</u> (SD+) existing separately are <u>poisonous</u> (SD+)
	28	Menene <u>poison</u> ? (SD+) (Hausa for: What is poison?)
Turn 2: Student 1	29	<u>Magani</u> (SD-) (Hausa for: Drugs)
Turn 3: Teacher	30 & 31	<u>Poison</u> (SD+) shine <u>guba</u> (SD-) (Hausa for: 'Poison' means poison). <u>Ko tooke</u> (SD-) in Fulfulde (Fulfulde: Poison)
	32	But if they are combined together they are not <u>poisonous</u> (SD+)
	33	A <u>compound</u> (SD+) has distinct set of <u>properties</u> (SD+) which do not resemble the <u>properties</u> (SD+) of its constituent <u>elements</u> (SD+)
	34	For instance, <u>hydrogen</u> (SD+) is a <u>gas</u> (SD+), <u>oxygen</u> (SD+) is a <u>gas</u> (SD+) but when they are combined they give <u>water</u> (SD+) which is <u>liquid</u> (SD-). The original <u>properties</u> (SD+) have been altered
	35	Also, the <u>mechanical</u> (SD+) separation of <u>elements</u> (SD+) of a <u>compound</u> (SD+) is impossible
	36	Baza'a iya raba <u>Sinadarin</u> (SD-) da <u>hanu</u> (SD-) ba (Hausa for: One cannot separate compounds using the hands.

Textbox 6.9 Excerpt from transcript 1, JSS3 (Grade 9) science private school

This text has been encountered in Textbox 6.9 on multilingual high flatlines where we stopped directly at line 28. In the present analysis we begin from line 30.

By employing some examples showing 'properties' of 'elements' as being 'fixed', in lines 30 and 31, the teacher steps down to unpack the term 'poison' in Hausa: "Poison (SD+) shine guba (SD-) (Hausa for: 'Poison' means poison)", which is a duplicating multilingualism / bilingual, and in Fulfulde, "Ko tooke (SD-) in Fulfulde (Fulfulde for: or Poison in Fulfulde)", which is also a duplicating multilingualism but trilingual as well. As she continues to elaborate in an English clause in line 32, the term 'poisonous', used earlier in line 27, was further re-introduced: "But if they are combined together they are not poisonous

(SD+)”. As the teacher brings this idea of compound properties in analytical lines 33, 34 and 35, she uses English clauses which comprise of several other SD+ terms and remains on the high level flatlines. For instance, in line 35, the clause, “Also, the mechanical (SD+) separation of elements (SD+) of a compound (SD+) is impossible”, has been unpacked in a simple Hausa clause as: “Baza’a iya raba Sinadarin (SD-) da hanu (SD-) ba (Hausa for: One cannot separate the elements using the hands)”, which is complementary multilingualism / bilingual. This informed the multilingual downward shift on the language profile in this part of the lesson transcript.

Given the multilingual knowledge profiles of downward shifts, we want to identify the kinds of multilingual upward shifts in the lesson transcripts.

6.2.1.5 What are the multilingual upward shifts that occur across transcripts?

Table 6.1.8 summarises data on upward shifts across multilingual knowledge profiles.

Upward semantic shifts (17 instances)	
Multilingual knowledge profiles	Total: 1 sequence
Duplicating multilingualism	0 (0.0%)
Complementary multilingualism	0 (0.0%)
Fragmentary multilingualism	1 (100%)
Overlapping multilingualism	0 (0.0%)

Table 6.1. 8 Distributions of upward shifts per multilingual profiles across transcripts

Table 6.1.8 indicates that the only dominant multilingual profile that occurred in upward semantic shifts is fragmentary multilingualism with a mean of 100% compared to a mean of 0.0% in duplicating multilingualism, complementary multilingualism, and overlapping multilingualism. Figure 6.10 presents an example:

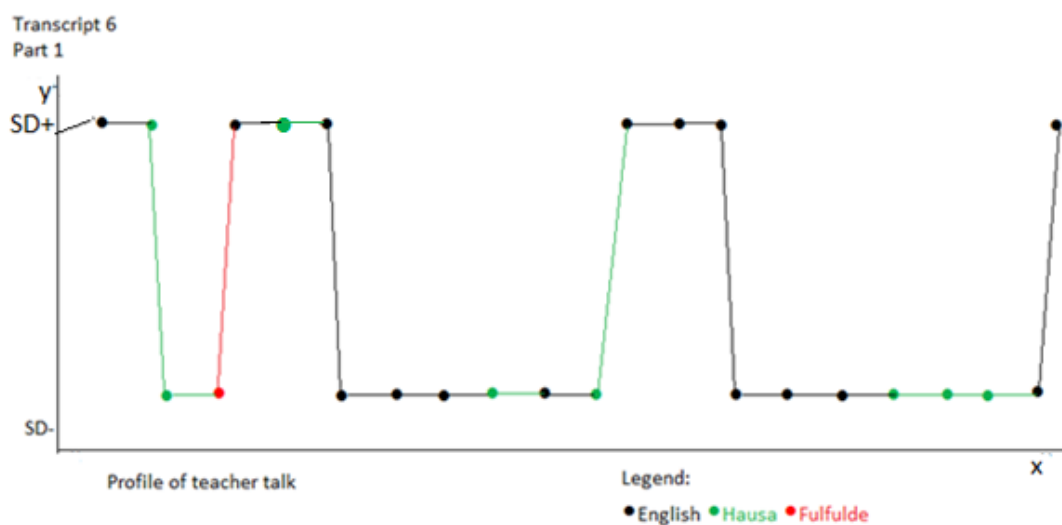


Figure 6.10 Multilingual upward shift

Figure 6.10 reveals a multilingual profile of upward semantic shifts of JSS3 (Grade 9), a private school business studies lesson transcript on the topic ‘trading, profit and loss account’.

The text that corresponds to Figure 6.10 is:

Turns	Analytical lines	Transcripts/texts
Turn 1: Teacher	1	(Teacher writes on the board) Okay, like I told you in the last class, you are going to what? Go and read the trading, profit and loss account (SD+), right?
Turn 5: Teacher	5	<i>Yau zamu dubaabinda ake ce</i> trading profit and loss account (SD+) (Hausa for: Today we are going to look at what is called <i>trading, profit and loss account</i>)
	6	<i>wato asusu cinikayya, riba da fadiwa</i> (SD-) (Hausa for: That is, trading, gain and loss account)
	7	siggaje fillu, riba be assaar (SD-) (Fulfulde: Business, profit and loss account).
	10 & 11	(Teacher writes on the board 2.05) so, that is our real topic. So now, what is trading? (SD+).
	12	[No answer: The teacher then says:] <i>Menene the word trading?</i> (SD+) (Hausa: What is the word trading?)
	13	[Still no answer: the teacher says:] <i>What do you understand by the word trading?</i> (SD+)
Turn 9: Student 1	14	Buying and selling (SD-)
Turn 12: Student 2	16	Business (SD-)
Turn 13: Teacher	17 & 18	Business (SD-), right? [No answer: The teacher then say:] <i>Saya da sayarwa</i> (SD-) (Hausa for: Buying and selling)
	19	Okay, exchange of what? (SD-)
Turn 15:	20	(joint construction) Goods and services (SD-)

Students & Teacher		
Turn 16: Teacher	21	<i>Saya da sayarwa</i> (SD-) (Hausa: Buying and selling)
	22	So the reason why we prepare <i>trading account</i> (SD+) in <i>accounting</i> (SD+) is to determine the <i>gross profit</i> (SD+)
	23 & 24	<i>If you are doing a business, are you getting me?</i> (SD-). <i>If you are doing a business you need to determine what?</i> (SD-)
	25	<i>Your profit</i> (SD+)
	26	Idan kana <i>kasuwanci</i> (SD-) yakamata ka gane ko kana samun <i>riba</i> (SD) ko kana <i>fadiwa</i> (SD-) (Hausa: If you are a doing business, there is the need to know whether you are getting profit or loosing)
	27	<i>So once you are doing business, you are doing what?</i> (SD+)
		<i>Trading</i> (SD+), right?

Textbox 6.10 Excerpt from transcript 6, JSS3 (Grade 9) business in public school

From analytical line 1, the teacher starts the lesson by recalling that she had informed the students on the need to prepare for this aspect of the lesson. In doing so, she uses English to express the key term '*trading, profit and loss account*' which is technical, as seen in the clause: "Okay, like I told you in the last class, you are going to what? Go and read the *trading, profit and loss account* (SD+), right?" Having received ratification from the students, the teacher switches languages in line 5 and proceeds in a Hausa clause to announce the topic: "*Yau zamu duba abinda ake ce 'trading profit and loss account* (SD+) (Hausa for: Today we are going to look at what is called *trading, profit and loss account*)", which is fragmentary multilingualism representing the multilingual upward shift.

Given the different kinds of multilingual knowledge profiles identified in the transcripts, it is necessary to investigate if these multilingual knowledge profiles can be linked to disciplines (science and business studies), grade levels (JSS1 and JSS3), and school types (private schools versus public schools).

6.3 Investigating the Differences in Composite Language-Knowledge Profiles

In this section of chapter 6, we will address research objective 4 of the study which is, "to investigate if there are differences in the composite language-knowledge profiles observed within and across science and business studies lessons, and to explain any such differences". We want to look at the differences according to the model we have in terms of language-knowledge profiles in disciplines (science and business studies), grade levels (JSS1 and JSS3) and school types (private schools versus public schools).

This section is divided into three parts. Part one will explore the dominant patterns of multilingual knowledge profiles across disciplines; part two will focus on the patterns of multilingual knowledge profiles across grade levels; and part three will determine the dominant patterns of multilingual knowledge profiles across school types.

Data for the analysis will be obtained from multilingual knowledge profiles across science and business studies transcripts.

In order to establish the differences, we draw from the idea of “canonical patterns” we developed from the transformational generative grammar using kernel sentences (Chomsky, 1957), which we presented in the methodology chapter. To enable us to analyze this research objective, the following hypotheses were formulated:

Hypothesis 1: Business lessons will have a more multilingual knowledge profile than the science lessons.

Hypothesis 2: We expect more multilingual knowledge profiles in JSS1 (Grade 7) than in JSS3 (Grade 9).

Hypothesis 3: Multilingual knowledge profiles will be more dominant in the public schools than in the private schools.

With regards to hypothesis 1, we observe that the nature of science content consists of “horizontal discourse” associated with highly technical terms that may not have equivalents in the learners’ main languages, whereas business studies nomenclatures fit into the “vertical discourse” (Beinstein, 1999) of the reality of the day-to-day lives of the students.

In terms of hypothesis 2, since the JSS3 (Grade 9) students are preparing for the senior class in their next academic year, the teachers may not feel it is necessary to use learners’ main languages, whereas in JSS1 (Grade 7), the use of multilingual talk will be more since the students are facing the challenges of junior high school for the first time.

For hypothesis 3, we assume in private schools that, firstly, the teachers are very well trained and, secondly, the students are from higher socio-economic backgrounds and the use of multilingual talk is not necessary. Conversely, in the public schools, we assume that most teachers are undertrained and may not be able to use the official classroom language throughout the lesson periods. Even if the teachers are well trained, it is possible that the

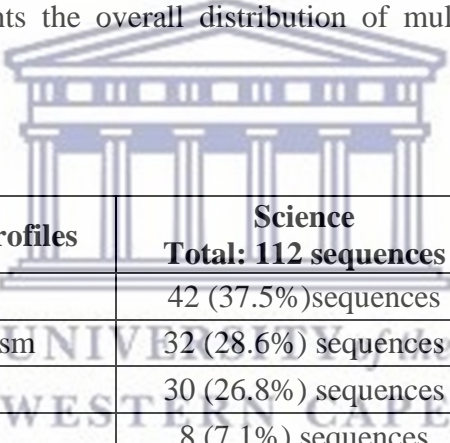
teachers are aware of the linguistic difficulties of their students, since most students are from low socio-economic backgrounds.

In the subsequent sections, we are interested in unravelling the differences in the composite knowledge-language profiles within and across science and business, within and across grade levels, and within and across school types.

6.3.1 To what extent are the differences in the patterns of multilingual knowledge profiles across subject types?

Drawing from the general patterns of multilingual knowledge profiles in section 6.2 above, it is necessary to compare whether multilingual profiles will be more prevalent in business studies lessons or in the science lessons.

Table 6.1.9 below presents the overall distribution of multilingual knowledge profiles across subject-types.



Multilingual knowledge profiles	Science Total: 112 sequences	Business studies Total: 69 sequences
Duplicating multilingualism	42 (37.5%) sequences	21 (30.3%) sequences
Complementary multilingualism	32 (28.6%) sequences	28 (40.6%) sequences
Fragmentary multilingualism	30 (26.8%) sequences	5 (7.2%) sequences
Overlapping multilingualism	8 (7.1%) sequences	15 (21.7%) sequences

Table 6.1. 9 Distributions of Multilingual Profiles across Subject Types

Table 6.1.9 shows that it is with three multilingual profiles that we notice glaring differences between science and business studies. The multilingual knowledge profiles are complementary multilingualism, fragmentary multilingualism, and overlapping multilingualism. Science is more fragmentary multilingualism, while business is dominant in complementary multilingualism and overlapping multilingualism. The mean of fragmentary multilingualism in science is 26.8%, compared to a mean of 7.2% in business. The gap of fragmentary multilingualism between science and business studies is 19.6%. With respect to complementary multilingualism, we observe a mean of 40.6% in business studies. When we equate this with the mean percentage of 28.6% in science, the gap is 12.0%. In overlapping

multilingualism, business studies has the highest mean of 21.7% compared to a mean of 7.1%. This means that there is a gap of 14.6%.

Table 6.1.9 further indicates that there is a slight similarity of multilingual profiles between science and business studies. The similarity is with duplicating multilingualism. The percentage mean of duplicating multilingualism in science is 37.5% while the mean of business studies is 30.3%.

These findings support our hypothesis 1 which states: “Business lessons will have a more multilingual knowledge profiles than the science lessons”. This is because business studies has the highest mean in two multilingual knowledge profiles: 40.6% in complementary multilingualism, and 21.7% in overlapping multilingualism, whereas science results revealed a greater percentage mean in duplicating multilingualism, with 37.5%.

Given the overall differences of multilingual knowledge profiles between science and business transcripts, we do not know if there are differences of multilingual knowledge profiles in grade levels across schools.

6.3.2 To what extent are there differences in the patterns of multilingual knowledge profiles across grade levels?

Having addressed the dominant multilingual profiles in different disciplines, the focus of this subsection is to find out whether the differences in multilingual profiles will be more pronounced in JSS1 (Grade 7) or in JSS3 (Grade 9).

Table 6.1.10 presents the overall distribution of multilingual knowledge profiles across grade levels (level-types).

Multilingual knowledge profiles	JSS1 (Grade 7) Total: 109 sequences	JSS3 (Grade 9) Total: 83 sequences
Duplicating multilingualism	27 (24.8%) sequences	36 (43.4%) sequences
Complementary multilingualism	51 (46.8%) sequences	18 (21.7%) sequences
Fragmentary multilingualism	13 (11.9%) sequences	22 (26.5) sequences
Overlapping multilingualism	18 (16.5%) sequences	7 (8.4%) sequences

Table 6.1. 10 Distributions of multilingual profiles across level types

Table 6.1.10 shows that there are two multilingual knowledge profiles with noticeable differences between JSS1 (Grade 7) and JSS3 (Grade 9). The multilingual knowledge profiles are duplicating multilingualism and complementary multilingualism. JSS3 (Grade 9) is dominant in duplicating multilingualism and JSS1 (Grade 7) is dominant in complementary multilingualism. The mean of duplicating multilingualism in JSS3 (Grade 9) is 43.4% compared to a mean of 24.8% in JSS1 (Grade 7). The gap between JSS3 (Grade 9) and JSS1 (Grade 7) in duplicating multilingualism is 18.6%. In terms of the differences, with respect to complementary multilingualism, we noticed the mean of 46.8% recorded in JSS1 (Grade 7). When compared to the mean of 21.7% in JSS3 (Grade 9), there is a huge difference of 25.1%.

This result corresponds with our hypothesis 2 which states that: “there will be more multilingual knowledge profiles in JSS1 (Grade 7) than in JSS3 (Grade 9)”. Given the fact that the gap between JSS1 (Grade 7) and JSS3 (Grade 9) in complementary multilingualism is 25.1%, means that much of the unpacking in JSS1 (Grade 7) lesson transcripts is done within complementary multilingualism. Therefore, our hypothesis has been confirmed.

Having examined the differences in multilingual knowledge profiles between level types, what are the differences in the multilingual knowledge profiles across school types?

6.3.3 To what extent are the differences in multilingual knowledge profiles across school types?

Given the data with respect to grade levels (in section 6.2.2), it is also interesting to find out whether the dominant multilingual profiles in terms of school types will be more frequent in public schools than private schools.

Table 6.1.11 below presents the overall distribution of multilingual knowledge profiles across school types (private schools and public schools).

Multilingual knowledge profiles	Public schools Total: 66 sequences	Private schools Total: 115 sequences
Duplicating multilingualism	22 (33.3%) sequences	41 (35.7%) sequences
Complementary multilingualism	18 (27.3%) sequences	42 (36.5%) sequences
Fragmentary multilingualism	21 (31.8%) sequences	17 (14.8%) sequences
Overlapping multilingualism	5 (7.6%) sequences	15 (13.0%) sequences

Table 6.1. 11 Distributions of multilingual profiles across school types

Table 6.1.11 indicates that there are only two multilingual knowledge profiles that manifest some differences between private schools and public schools. The multilingual knowledge profiles are complementary multilingualism and fragmentary multilingualism. We notice that private schools are dominant in fragmentary multilingualism, whereas public schools are more dominant in complementary multilingualism. The mean of complementary multilingualism in public schools is 36.5%, whereas the mean of private schools is 27.3%. When we contrast the mean of private schools and that of the public schools, there is a difference of 9.2%. Looking at the disparity in fragmentary multilingualism between private schools and public schools, we observed a mean of 31.8% in private schools. When we distinguish an average of 14.8% in public schools, there is a margin of 17.0%. The table 6.1.11 also revealed evidence of similarity between private schools and public schools on one of the other multilingual knowledge profiles, duplicating multilingualism. The mean percentage of duplicating multilingualism in private schools is 33.3%, while the public schools revealed a mean of 35.7%.

These findings confirm our hypothesis 3, which states that “multilingual knowledge profiles will be more dominant in the public schools than in the private schools”. Although both private schools and public schools have similarity in duplicating multilingualism, the public school transcripts have the highest multilingual profiles in both duplicating multilingualism and complementary multilingualism. This could be as a result of the fact that teachers in public schools feel learners find it difficult to understand the official classroom language, and therefore need to frequently unpack the lessons using the learners’ home language. Our hypothesis has therefore been confirmed.

6.4 Discussions

Arising from the above, it is worth noting that when Maton (2013) talks about knowledge-blindness, he is referring to the fact that so many studies have made conclusions based on the assumption that knowledge is the basis for such studies – that we know something about the structure of knowledge – when in the real sense, it is not the case. For instance, in Nigeria and beyond, a large body of research in science has been conducted to unravel the difficulties in teaching and learning science in schools (Ajaja & Eravwoke, 2013; Kempa, 1991; Osuolale, 2014; Johnstone & Kellett, 1980). Over three and half decades ago, Johnstone and Kellett (1980) attempted to develop a working hypothesis for learning difficulties in school science in order to specifically explain the idea behind success and failure in problem-solving

by science students. The authors acknowledged that there are “many areas of perceived difficulty in our modern science syllabuses” (Johnstone and Kellett 1980:180). In other words, the operating science syllabuses are faulty and account for students’ poor performance in science. Focusing on the problems of teaching and learning science in junior secondary schools in Nasarawa State, Nigeria, Osuolale (2014) engaged a random sampling of 150 science students and 20 science teachers across ten secondary schools to identify the factors that are responsible for the difficulty in the teaching and learning of basic science in secondary schools. He developed questionnaires for both teachers and students. Osuolale (2014:114) found that teachers and students “agreed strongly to the fact that, lack of instructional aids, lack of hard work on the part of the students and the poor foundation of students are the major problems of teaching and learning of basic science”. This indicates that the concepts of science are being taught poorly, coupled with a poor science background, emanating from a lack of equipped science laboratories. Likewise, Kempa (1991) also showed concern about the learning difficulties of students in science and offered to uncover the causes and to also proffer solutions. One of the fundamental challenges of the students in learning science, according to Kempa (1991:120), emerged from their language capacity “in relation to technical terms or to general terms with context-specific specialized meanings, or the complexity of sentence structure and syntax used by the teacher(s)”. Perhaps both teachers and students lack “power word” and “power grammar” (Martin, 2013:25). In other words, science is a specialized field and uses specialized language comprising of its jargons. The language of science involves “grammatical metaphor (which) is essential for both defining technical processes and explaining them” (Martin, 2013:28). Given the above literature, we are tempted to conclude that the authors in the literature do not base their research on the understanding of the structure of knowledge in science, and therefore do not “share a desire for cumulative knowledge-building” (Maton, 2013:8) in science teaching and learning.

Looking at the large body of literature on translanguaging (e.g. Duarte, 2018; Canagarajah, 2011; Lewis, Jones & Baker, 2012; Deroo & Ponzio, 2019; Collins, Sánchez & España, 2019; García & Otheguy, 2020; Karlsson, Larsson & Jakobsson, 2019), and code switching (e.g. Grant & Nguyen, 2017; Ravnil Narayan, 2019; Simasiku, Kasanda & Smit, 2015), or multilingual teaching in the classrooms (e.g. Madiba, 2014; Schissel, Leung, López-Gopar & Davis, 2018; Ma, 2019; Vázquez & Ordóñez, 2019; Tavares, 2015; Lo, 2015; Igboanusi & Peter, 2016), the emphasis is typically only on language exchange and deploying

learners' repertoire as resources for learning. The only item claimed by these studies that comes close to knowledge is when an idea is identified as presentational and another as explanatory. For example, Narayan (2019:435) conducted a study on code switching as a "Linguistic Resource" in the Fijian ESL classrooms and revealed that "teachers see L1 uses as an acceptable belief towards the repertoire of pedagogical uses of Fiji Hindi (language) to execute interactions of ESL teaching". This means that, the concern of the study is only to determine the learners' use of their linguistic resources in the classroom interactions. Another study put forward by Duarte (2018:10) explored translanguaging as a better instrument to be used by teachers to scaffold and link knowledge in different languages. Again, Duarte's interest was on how the teachers used different languages as instrument of scaffolding meaning. Even when Duarte (2018) talks of "link knowledge in different languages" there has not been any tangible material to show. Similarly, an ecological lens has also been used to analyze pre-service teachers' translanguaging stance in the US by Deroo and Ponzio (2019). Deroo and Ponzio (2019:3) claim that, rather than alternating languages, a translanguaging model suggests teachers should "creatively integrate all semiotic resources to communicate" in the classroom. Their study focused on the semiotic resources communicated by teachers and students in the classroom talk and not on the knowledge transmission aspect. Another study conducted to sustain and develop teachers' dynamic bi/multilingualism in New York City explored teachers' linguistic backgrounds and experiences during a Spanish-English bilingual teacher preparation programme by Collins, Sánchez & España (2019). The basic idea behind Collins, Sánchez and España's (2019) study was to find out whether a bi/multilingual education programme helped learning among bilingual students.

Regrettably, the aforementioned studies do not at all engage in a serious manner with what is actually inside the knowledge (Maton, 2013, 2014a, 2014b). What makes information explanatory or presentational is taken for granted by the body of literature in code switching and translanguaging. As a result, so many dichotomies have been drawn which may not necessarily be correct. For example, when information is given in the non-official classroom language(s), then it is explanatory knowledge. Rather than approaching from the standpoint of knowledge, the literature tackles knowledge from the standpoint of language. This gives the impression that we cannot have material that is expressed in Hausa or Fulfulde that is even more difficult than the material that was expressed in English.

Our study makes very obvious what Maton (2013) means by knowledge-blindness. In our context, knowledge-blindness has to do with statements being made about knowledge without

necessarily engaging with the structure of knowledge. The literature on translanguaging hardly ever engages with the structure of knowledge (Deroo & Ponzio, 2019; Collins, Sánchez & España, 2019), but the language repertoire of the learners. Similarly, what we obtained from code switching literature is the language alternation without engaging with the knowledge types (Grant & Nguyen, 2017; Narayan, 2019). The general idea is that when the non-official classroom languages are used, the teachers are dealing with what is referred to as explanatory knowledge. The consequence of doing that is just to assume that something in the non-official classroom language is explanatory, but our data has indicated that it is not the case, because we have seen instances of the non-official classroom languages being in SD+ (across the transcripts).

In terms of language-knowledge profiles, our study has shown that something can be done about this knowledge-blindness. By applying Maton's (2013) categories of knowledge profiles, we have been able to realize why knowledge of a certain type can be called explanatory and knowledge of another type is called non-explanatory. For instance, our knowledge profiles have shown that sometimes, even when the knowledge is explanatory, it is not in the non-official classroom languages (Fulfulde or Hausa), but in the official classroom language: English. By using the knowledge profiles, we also noticed that there are at times, even when we have a wave or a low semantic flatline, the language that is used is English. We further observed that there are situations when we have high flatlines with semantic waves, and the language that is used is either Hausa or Fulfulde (language knowledge profiles of transcript 8) and not the official classroom language.

6.5 Summary of the Chapter

In this chapter, we have answered the third and fourth research questions of the study. We addressed the third research question by taking a tour of our data to, first, identify the overview of knowledge profiles generated from the lesson transcripts and realized that Maton's (2013) knowledge profiles were adequate for analyzing our data. The answer to the second part of the third research question was on how language mapped on the profiles. An aspect of linguistic landscapes, types of multilingual information, has helped our understanding of inter- and intra-lingual communication in multilingual spaces of the discourse of multilingual teacher-talk.

In answering the fourth research question, we looked closely at the differences in the composite knowledge-language profiles that occurred across science and business lessons. In order to have an in-depth analysis, we developed canonical patterns or agency pairs and noticed that business lessons have more multilingual knowledge-language profiles compared to science lessons.



CHAPTER 7: THE EFFECT OF KNOWLEDGE-LANGUAGE PROFILES ON STUDENTS' PERFORMANCE

7 Introduction

This chapter addresses research objective 5 of the study which seeks “to analyze the various effects which the combination of knowledge profile and language profile has on students’ understanding of the lesson and on their demonstration of their knowledge”. We seek to establish the relationship between the composite knowledge-language profiles of lesson segments related to specific questions posed in the assessment tasks and students’ performances on the corresponding questions. In other words, we are interested in knowing the following:

- What composite knowledge-language profiles appear to best explain learners’ performance to a question in business lessons at JSS1 (Grade 7) versus JSS3 (Grade 9), and across private schools and public schools?
- What composite knowledge-language profiles appear to best explain learners’ performance to a question in science lessons at JSS1 (Grade 7) and JSS3 (Grade 9), and across private schools and public schools?

In order to arrive at a fine-grained analysis, the chapter is divided into three main sections. The first section is an overview section in which the data on knowledge-language profiles and students’ performance is presented according to a number of parameters (subject type, grade level, and type of school). In the second section, we interrogate this data from the standpoint of the reinforcement or repetition of answers in a bid to determine if this also plays a role in the performance of students. The third section discusses the findings in relation to the relevant literature.

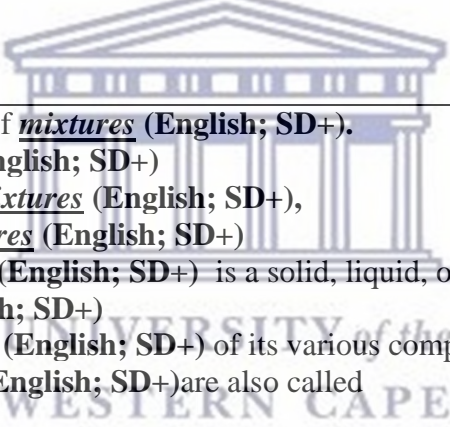
Using both “the measures of centre of tendency” (mean) and “measures of variability” (range) (Sykes, Gani, Vally, 2016: 276-277) of our data, we fix the performance of the students into the following groups:

- a) 60% to 100%: stellar performance
- b) 0.0% to 59%: less than stellar performance

7.1 An overview of knowledge-language profiles and performance of students

In this section, we will examine lesson transcripts from the language and knowledge profiles and then we will look at the questions that the students were given. The intention is to find out how the encoding of knowledge and the language used in parts of a lesson that contain answers to specific questions impact students' performance on those questions. To make it possible for the reader to understand how the data is presented in subsections 7.1.1 to 7.2.1, we provide below two illustrations, one from a lesson in science for JSS3 (Grade 9) at a private school, and the other from a business lesson in JSS1 (Grade 7) at a private school. Let us begin with the former.

A question asked by the teacher in the assessment task was: "Differentiate between homogeneous mixtures and heterogeneous mixtures". The relevant segment of the lesson transcript in which the answer to this question is found is presented as Textbox 7.1, and a knowledge-language modelling of the segment is presented as Figure 7.1.

- 
1. Now, there are two types of mixtures (English; SD+).
 2. Two types of mixtures (English; SD+)
 3. We have homogeneous mixtures (English; SD+),
 4. and heterogeneous mixtures (English; SD+)
 5. A homogeneous mixture (English; SD+) is a solid, liquid, or
 6. gaseous mixtures (English; SD+)
 7. with the same proportions (English; SD+) of its various components in any given sample.
 8. homogeneous mixtures (English; SD+) are also called
 9. solutions (English; SD+)
 10. But aahhhmm heterogeneous mixtures (English; SD+),
 11. they consist of different substances (English; SD+).
 12. It has components whose quantities vary throughout the sample. (English; SD-) Right?
 13. They both, the homogeneous mixtures (English; SD+) and
 14. heterogeneous mixtures. (English; SD+)
 15. they have Physical properties (English; SD+) and
 16. chemical properties (English; SD+) such as boiling point or melting point

Textbox 7.1 Excerpt from transcript 2, JSS3 (Grade 9) science in private school, Question 4

In Textbox 7.1, only one language, English, is used. Key knowledge units or terms have been given LCT codes, on which basis the knowledge-language profile in Figure 7.1 below is produced. See Figure 7.1.

Transcript 2: School A, JSS3 (Grade 9), private school
 Science lesson. Topic: Compound elements
 Question 4: Differentiate between homogeneous mixtures and heterogeneous mixtures

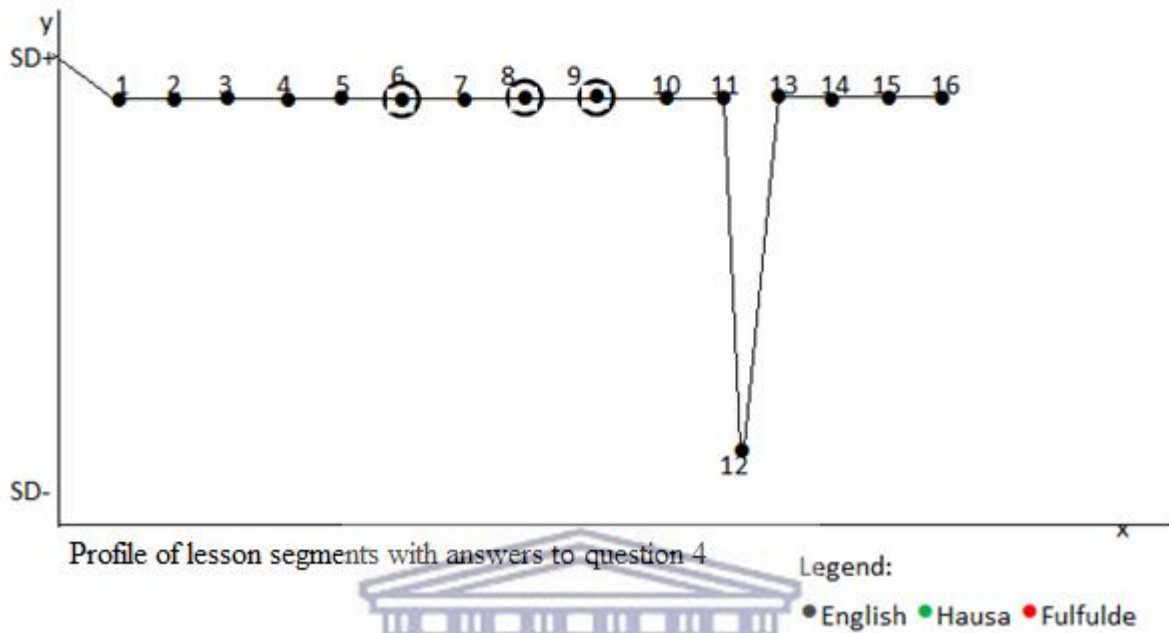


Figure 7.1 Modelling of excerpt from transcript 2, JSS 3 (Grade 9) Science in Private school Question 4

Looking at the profile in Figure 7.1, which shows largely a high density flatline with one language, it is worth mentioning that the areas circled are areas in the lesson where answers to this question can be found. This means the answers can be found in three different places. We also see that English is the only language that is used. We also see that the three places where the answers occur are coded high semantic density, SD+. Let us turn now to the performance of the students.

For the question (no. 4), “Differentiate between homogeneous mixtures and heterogeneous mixtures”, the following results were obtained: eight students (40%) answered correctly, four (20%) students answered part of the answer correct, seven students (35%) answered incorrectly, and one student (5%) provided no answer.

Let us consider the second example, this time from business. The question that was asked by the teacher was: “Explain two (2) forms of business”. The relevant segment of the lesson transcript is presented in Textbox 7.2 below.

1. We have them, the first is **business unit** (English; SD+) or
2. **sole proprietorship** (English; SD+) or
3. **one man business** (English; SD-) all these names are singing the same national anthem
4. **mutum daya mai harkar kasuwancin** (Hausa; SD-) (Hausa for: One man doing business)
5. **luumowo goto** (Fulfulde; SD-) (Fulfulde for: One man business)
6. **This is a business set up by one person** (English; SD-).
7. **He sources the money and start up the business** (English; SD-)
8. **He knows the profit and loss** (English; SD-)
9. **Mutum daya maiharkar kasuwaci yasan ribarsa da fadiwarsa** (Hausa; SD-) (Hausa for: One man doing a business knows his gain and loss).
10. As you are the **sole proprietor** (English; SD+) of the
11. **business** (English; SD-), you make decision on your own.
12. In **business unit** (English; SD+) or
13. **sole proprietorship** (English; SD+) or
14. **one man business** (English; SD-), it is up to you to make decision on how to operate your business activity or close it.
15. **Idan kana kasuwanci, cire dangi da abokane** (Hausa; SD+) (Hausa for: When doing business, you should remove friends and relations).
16. **If you put friends in your business, it will collapse** (English; SD-).

Textbox 7.2 Excerpt from transcript 5 JSS1 (Grade 7) business in private school, Question 1

The composite knowledge-language profile is presented as Figure 7.2 below:

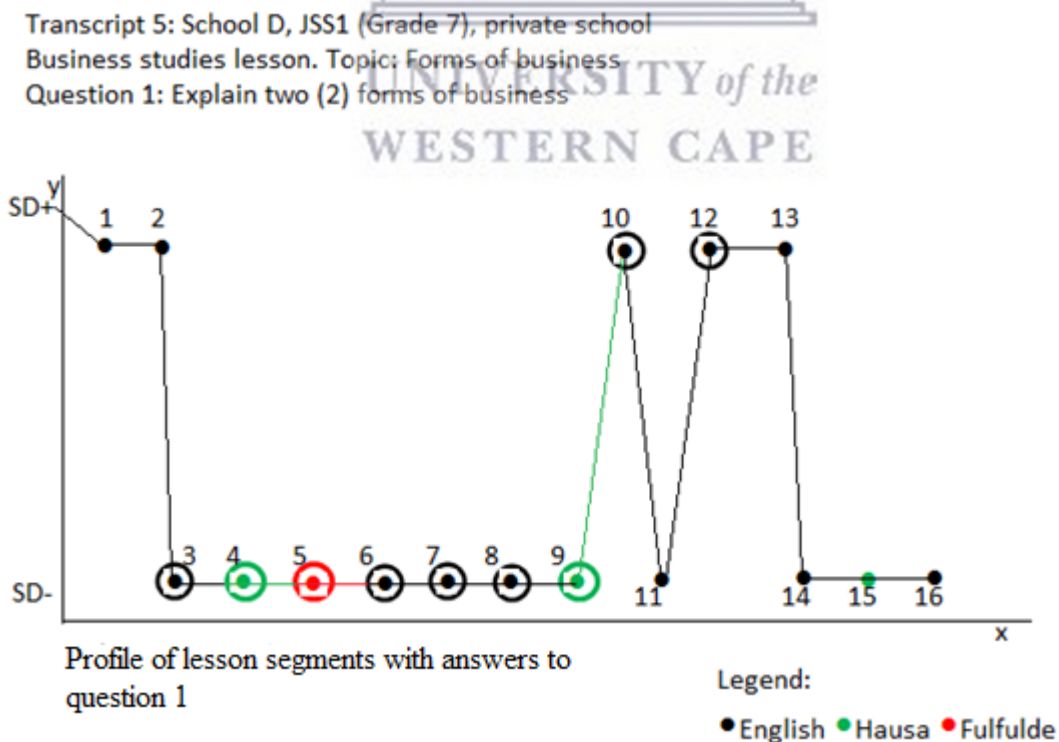


Figure 7.2 Modelling of excerpt from transcript 5, JSS1 (Grade 9) Business in Private school, Question 1

Figure 7.2 illustrates a semantic wave and shows that answers can be found in nine different places. Unlike the science question, in this question, we find that English, Hausa and Fulfulde are used. We further observe that of the nine places where the answers are found, seven are coded as low semantic density SD- and two as high semantic density SD+. In terms of the performance of the students in relation to this question, all 20 students who sat for the test answered correctly (100%).

It is based on this sort of analysis that data is presented in subsections 7.1.1 to 7.1.7 below, then analyzed from the standpoint of repetition or reinforcement in section 7.2

7.1.1 An overview of knowledge-language profiles and performance of students in science transcripts

This section is interested in finding the overall patterns of composite knowledge-language profiles and the performance of students across science lesson transcripts.

Table 7.1 below presents the overall distribution of knowledge-language profiles and percentage of students getting the answers correctly across science transcripts.

Science:	Test 1	
School type:	Private school	
Grade level:	JSS3 (Grade 9)	
Knowledge-language profiles to Question 1	SD- and E/H/F	100% students with correct answer
Knowledge-language profiles to Question 2	SD+ and English	40% students with correct answer
	SD- and H/F	
Knowledge-language profiles to Question 3	SD+ and English	30% students with correct answer
	SD- and Hausa	
Knowledge-language profiles to Question 4	SD+ and English	55% students with correct answer
	SD- and H/E/F	
Knowledge-language profiles to Question 5	SD+ and E/H	100% students with correct answer
	SD- and H/E	
Science	Test 2	
School type	Private school	
Grade level	JSS3 (Grade 9)	
Knowledge-language profiles to Question 1	SD+ and English	15% students with correct answer
	SD+ and English	
Knowledge-language profiles to Question 2	SD- and E/H/F	25% students with correct answer
Knowledge-language profiles to Question 3	SD+ and English	35% students has got correct answer
	SD- and Hausa	
Knowledge-language profiles to Question 4	SD+ and English	40% students with correct answer
Knowledge-language profiles to Question 5	SD+ and English	35% students has correct answer

	N/A	
Science	Test 3	
School type	Public school	
Grade level	JSS3 (Grade 9)	
Knowledge-language profiles to Question 1	SD- and English	20% students with correct answer
Knowledge-language profiles to Question 2	SD- and English	0.0% students with correct answer
Knowledge-language profiles to Question 3	N/A	100% students got the correct answer
	SD- and H/F/E	
Knowledge-language profiles to Question 4	SD- and H/F/E	75% students with correct answer
Knowledge-language profiles to Question 5	SD- and H/E	70% students with correct answer
Science	Test 4	
School type	Private school	
Grade level	JSS1 (Grade 7)	
Knowledge-language profiles to Question 1	SD+ and English	30% students with correct answer
	SD- and H/F/E	
Knowledge-language profiles to Question 2	SD+ and English	100% students with correct answer
Knowledge-language profiles to Question 3	SD+ and English	10% students with correct answer
	SD- and E/H/F	
Knowledge-language profiles to Question 4	SD- and F/H/E	30% students got the correct answer
Knowledge-language profiles to Question 5	SD- and H/E	35% students got the correct answer
Science	Test 5	
School type	Public school	
Grade level	JSS1 (Grade 7)	
Knowledge-language profiles to Question 1	SD- and F/H	75% students got the correct answer
Knowledge-language profiles to Question 2	SD+ and English	80% students with correct answer
	SD- and E/H/F	
Knowledge-language profiles to Question 3	SD+ and English	60% students got the correct answer
	SD- and H/F	
Knowledge-language profiles to Question 4	SD+ and English	85% students with correct answer
	SD- and E/H/F	
Knowledge-language profiles to Question 5	SD+ and English	65% student with correct answer
Science	Test 6	
School type	Private school	
Grade level	JSS1 (Grade 7)	
Knowledge-language profiles to Question 1	SD- and English	25% students got the correct answer
Knowledge-language profiles to Question 2	SD+ and F/E	80% students with correct answer
	SD- and F/H	
Knowledge-language profiles to Question 3	SD+ and English	45% students got the correct answer
Knowledge-language profiles to Question 4	SD+ and English	15% students with correct answer

Knowledge-language profiles to Question 5	SD- and E/H/F	95% student with correct answer
Science	Test 7	
School type	Public school	
Grade level	JSS3 (Grade 9)	
Knowledge-language profiles to Question 1	SD+ and E/H/F	35% students got the correct answer
	SD- and H	
Knowledge-language profiles to Question 2	SD+ and English	35% students with correct answer
Knowledge-language profiles to Question 3	SD+ and English	65% students got the correct answer
Knowledge-language profiles to Question 4	SD+ and English	80% students with correct answer
	SD- and H/F	
Knowledge-language profiles to Question 5	SD+ and English	5% student with correct answer

Table 7.1 Knowledge-language profiles and performance across science transcripts

From this Table 7.1, we have generated summary tables. Table 7.1.1 below summarises the data for the science tests.

Overview of results: science (total of 140 students)			
Knowledge-language profiles	Languages connected to answers	Percentage mean of answers (35 questions)	
		60% and above scored on 15 number of questions	59% and below scored on 20 number of questions
Low semantic density profiles	More than one language	12 (34.3%)	7 (20%)
	One language	N/A	3 (8.6%)
High semantic density profiles	More than one language	3 (8.6%)	7 (20%)
	One language	N/A	3 (8.6%)

Table 7.1. 1 Summary of overall science tests

Table 7.1.1 shows that on 12 of the 35 questions in which students scored above 60% the profile of the corresponding answers in the lesson transcripts was low semantic density with more than one language. Even though some 7 questions whose answers had the same profile saw students scoring below 60%, overall this profile (low semantic density and more than one language) was the one associated with the most number of questions answered most correctly by students.

Let us consider some examples, first of material associated with low semantic density with more than one language (which had the most positive impact on students' performance), and secondly, with material associated with high semantic density in only one language where the performance was not as good.

For the former (low semantic density + more than one language), the encoded knowledge-language profile of a relevant segment of a science lesson is presented as Textbox 7.3. The relevant question to be answered was: 'Mention four (4) places where immunization is done'. Sample correct answers provided by students included the following: student a) '**hospitals, homes, schools, dispensary, clinic etc**'; student b) '**home, churches, mosque, clinic**'; student c) also '**churches, schools, houses, hospital**'; and another student d) '**health clinics, churches, dispensaries and schools**'. The relevant segment of the lesson transcript is presented in Textbox 7.3 below.

1. Teacher: Where can we get immunization? (SD+) [No answer: The teacher then says:]
2. Teacher: *Ha toi en hebata batal riga kafi?* (SD-) (**Fulfulde for:** Where do you get immunisation?). Yes, Bilkisu
 3. Student 9: Schools (SD-)
 4. Teacher: Correct. Ha makaranta (SD-) (**Fulfulde for:** In schools)
 5. Student 10: Clinics (SD-)
 6. Student 10: Hospital (SD-)
 7. Teacher: A cikin manyar asbitoci (SD-) (**Hausa for:** In general hospitals)
 8. Teacher: Immunisation can also be done in churches, mosques even in our homes. (SD-)
9. Teacher: *Akwai ma'aikatan asibitocin da suke zuwa gidaje don bawa yara aluran riga kafi citutuka* (SD-) (**Hausa for:** There are health workers who visit homes in order to immunize children against the killer diseases)

Textbox 7.3 Excerpt from transcript 9, JSS1 (Grade 7) science in private school, Question 4

For the latter (high semantic density + one language), the encoded knowledge-language profile of a relevant segment of a science lesson is presented as Textbox 7.4. The relevant question to be answered was: 'Discuss briefly how to control the depletion of ozone layer'. Sample wrong answers provided by students included the following: student a) '**reducing the are of clorobon, use of alternative use carbon**'; student b) '**protection of althennatic card carbon, it use to protect alternative from sun raise**'; and student c) '**reduction of crop viell – it causes cancer**'. The relevant segment of the lesson transcript is presented in Textbox 7.4 below.

1. Teacher: We can control depletion (SD+) of ozone layer (SD+) through the following
16. Reducing the use of CFCs (SD+),
3. developing substitute to replace CFCs (SD+)
- 4 and using alternative sources of energy (SD+).

Textbox 7.4 Excerpt from transcript 10, JSS3 (Grade 9) science in public school, Question 5

This finding that low semantic density and more than one language profiles lead to enhanced student performance answers in part our question two on “what composite knowledge-language profiles appear to best explain the performance of the students above and below 60% score in science lessons at JSS1 (Grade 7) and JSS3 (Grade 9), and across private schools and public schools?” Our findings reveal that the low semantic density knowledge profiles best explain the performance of students scoring above 60% in the overall science transcripts, with a mean of 34.3%.

Let us now turn to composite knowledge-language profiles and performance in science from the standpoints of grade levels and school types.

7.1.2 What are the particular profiles at grade levels that are associated with the best performance in science?

In this subsection, we are interested in ascertaining whether there are differences in the composite knowledge-language profiles associated with answers and performance between JSS1 (Grade 7) and JSS3 (Grade 9) science students.

Table 7.1.2 summarises the data for the science tests across grade levels.

Science: Grade levels results					
Knowledge-language profiles	Languages associated with answers	JSS1 (Grade 7 = total of 60 students) % mean of answers (15 questions)		JSS3 (Grade 9 = total of 80 students) % mean of answers (20 questions)	
		60% & above scored on 8 number of questions	Below 60% scored on 7 number of questions	60% & above scored on 7 number of questions	Below 60% scored on 12 number of questions
Low semantic density profiles	More than one language	6 (40%)	4 (26.7%)	6 (30%)	4 (20%)
	One language	N/A	1 (6.7%)	N/A	2 (10%)
High semantic density profiles	More than one language	N/A	N/A	N/A	2 (10%)
	One language	2 (13.3%)	2 (13.3%)	1 (5%)	4 (20%)

Table 7.1. 2 Summary of science tests across JSS1 (Grade 7) and JSS3 (Grade 9)

Table 7.1.2 indicates that at both JSS 1 and JSS 3 levels, the most number of questions (6 respectively) on which 60% of students getting the answer correctly were those whose answers in the lesson transcripts had the following composite knowledge-language profile: low semantic density and more than one language.

These findings answer part of our question, “what composite knowledge-language profiles appear to best explain the performance of the students to a question in science lessons at JSS1 (Grade 7) and JSS3 (Grade 9)?” Our findings reveal that the low semantic density knowledge profiles best explain the performance of students in JSS3 (Grade 9).

7.1.3 Students of which school type benefit more from what knowledge-language profile in science?

In this subsection of the chapter, we want to unravel which knowledge-language profiles appear to better serve science students in private schools versus public schools.

Table 7.1.3 summarises the data for the science tests across school types.

Science: School types results					
Knowledge-language profiles	Languages associated with answers	Private schools (80 students) % mean of answers (20 questions)		Public schools (60 students) % mean of answers (15 questions)	
		60% & above scored on 6 number of questions	Below 60% scored on 14 number of questions	60% & above scored on 11 number of questions	Below 60% scored on 4 number of questions
Low semantic density profiles	More than one language	4 (20%)	8 (40%)	8 (53.3%)	N/A
	One language	N/A	1 (5%)	N/A	2 (13.3%)
High semantic density profiles	More than one language	1 (5%)	1 (5%)	1 (6.7%)	N/A
	One language	1 (5%)	4 (20%)	2 (13.3%)	2 (13.3%)

Table 7.1. 3 Summary of science tests across private schools and public schools

Table 7.1.3 indicates that low semantic density with more than one language led to better results in public schools, but not in private schools. No profile appears to produce any advantages for students in private schools.

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7.1.4 An overview of knowledge-language profiles and performance of students in business lesson transcripts

In this part of chapter 7, we will examine the composite knowledge-language profiles associated with answers and performance of students in business lessons.

Table 7.2 presents the overall distribution of knowledge-language profiles and performance across business transcripts.

Business	Test 1	
School type:	Public school	
Grade level:	JSS1 (Grade 7)	
Knowledge-language profiles to Question 1	SD- and E/H/F	35% students with correct answer
Knowledge-language profiles to Question 2	SD+ and English	22.2% students with correct answer
Knowledge-language profiles to Question 3	SD+ and English	15% students with correct answer
	SD- and H/F/E	
Knowledge-language profiles to Question 4	SD+ and English	45% students with correct answer
	SD- and H/E/F	
Knowledge-language profiles to Question 5	SD+ and English	5 % students with correct answer
	SD- and E/H	
Business	Test 2	
School type	Private school	
Grade level	JSS1 (Grade 7)	
Knowledge-language profiles to Question 1	SD+ and English	100% students with correct answer
	SD- and E/H/F	
Knowledge-language profiles to Question 2	SD+ and English	100% students with correct answer
	SD- and E/H/F	
Knowledge-language profiles to Question 3	SD+ and English	95% students has got correct answer
	SD- and E/H/F	
Knowledge-language profiles to Question 4	SD+ and English	85% students with correct answer
	SD- and E/H/F	
Knowledge-language profiles to Question 5	SD+ and English	95% students has correct answer
	SD- and E/H/F	
Business	Test 3	
School type	Private school	
Grade level	JSS3 (Grade 9)	
Knowledge-language profiles to Question 1	SD+ and English	90% students with correct answer
	SD- and E/H	
Knowledge-language profiles to Question 2	SD+ and English	55% students with correct answer
Knowledge-language profiles to Question 3	SD+ and English	65% students got the correct answer
	SD- and E/H	
Knowledge-language profiles to Question 4	SD+ and English	0.0% students with correct answer
	SD- and E/H	
Knowledge-language profiles to Question 5	SD+ and English	35% students with correct answer
	SD- and English	

Table 7.2 Knowledge-language profiles and performance across business transcripts

From Table 7.2, we have generated summary tables. Table 7.2.1 summarises the data for the business tests.

Business: overview of results			
Knowledge-language profiles	Languages connected to answers	Percentage mean of answers (60 students)	
		60% and above scored on 7 number of questions	Below 60% scored on 8 number of questions
Low semantic density profiles	More than one language)	7 (46.7%)	5 (33.3%)
	One language	N/A	N/A
High semantic density profiles	More than one language	N/A	N/A
	One language	N/A	3 (6.7%)

Table 7.2. 1 Summary of overall business tests

Table 7.2.1 shows that low semantic density and more than one language is the profile in business lessons associated with the most number of questions on which 60% and above of the students scored the answer correctly.

Let us consider some examples, first of material associated with low semantic density with more than one language (which had the most positive impact on students' performance), and second, with material associated with high semantic density in only one language where the performance was not as good.

For the former (low semantic density + more than one language), the encoded knowledge-language profile of a relevant segment of a business lesson is presented as Textbox 7.5. The relevant question to be answered was: 'List two advantages and two disadvantages of sole trader'. Sample correct answers provided by students included the following:

student a) writes, advantages **(i) 'the sole trader take fast decision of his own, (ii) it is not difficult to start and run;** disadvantages **(i) Sole trader is very small because of lack of capital, (ii) He bears the loss if the business fails';**

student b) advantages **(i) 'It is easy to run one man business, (ii) It gives individual the courage on self employment';** on disadvantages, the student states **(i) Sole trader business is small because of lack of capital, (ii) The profit and loss are meant for him';**

student c) advantages (i) ‘It is easy to start one man business, (ii) the sole trader takes quick decisions on his own’; on the disadvantages, (i) ‘Sole trader starts his business with little capital. And it is small because of lack of capital, (ii) He is the only one that bears the loss or suffers the loss’. The relevant segments of the lesson transcript are presented in Textbox 7.5 below.

1. Teacher: The advantages of sole proprietorship (SD+) includes benefit of large capital (SD+)
2. *Kai ne mai iko da riban ka* (SD-) (Hausa for: You alone will control the profit)
3. When you are having billions of naira and you put it into business, you expect to have profit on that amount (SD-)
4. *An feere nyamata riba ma* (SD-) (Fulfulde for: You are the only one to enjoy your gain)
5. Dadın kasuwancin mutum daya shine yana da sauƙin lura (SD-) (Hausa: The advantage of one man business is that it is simple to manage).
6. It does not require much money to start; (SD-)
7. kamar kossai, allele, kankara (SD-) (Hausa for: Like beans cake, another bean snack, ice-blocks.
8. Kudi kadan zai isa fara kasuwancin kossai ko allele (SD-) (Hausa: Little money can start up the business of beans cake)

Textbox 7.5 Excerpt from transcript 5, JSS1 (Grade 7) business in private school, Question 5

For the latter (high semantic density plus one language), the encoded knowledge language profile of a relevant segment of a business lesson is presented as Textbox 7.6 below. The relevant question to be answered was: ‘State any four types of occupation that people do in your community’. Sample wrong answers provided by students included the following: Student a) provide the answers as ‘**doctor, nursing, farming, trader**’; Student b) mentioned ‘**provision shop, welder, peaditure, mamature**’; Student c) stated ‘**police, transporter, ministry, economic**’. The relevant segments of the lesson transcript are presented in Textbox 7.6 below.

1. Teacher: So now let us look at different *types of job* (SD-)
2. Now, what are the types of occupation? (SD+) (No answer)
3. Akwai ayuka daban-daban wanda mutane suke yi (SD-) (Hausa There are different types of work that people do)
4. We have five types of occupation. Primary occupation, Secondary occupation, Constructive occupation, Manufacturing occupation and Services occupation (SD+)
5. Duk ayukan da mutane suke yi suna karkashin wa’yan nan panoni biyar (SD+) (Hausa: All the work that people do is grouped under these five types)
6. Now all these are works that people do can be grouped under these five types of occupation (SD+)
7. Menene primary occupation? (SD+) (Hausa: What is primary occupation?) (No answer)

8. **Primary occupation** is **the work that people do such as farming, fishing, blacksmithing** (SD)
9. **Bana remuggo ngaawa: pidawo, Makejo** (SD-) (Fulfulde: Like farming, fishing, hunting, blacksmithing)
10. **Kamun kifi ko suu, farauta namun daji**. (SD-) (Hausa for: Catching fish or fishing, hunting of bush meat.)

Textbox 7.6 Excerpt from transcript 5, JSS1 (Grade 7) business in public school, Question 2

7.1.5 What profiles at grade levels are associated with the best performance in business?

In this section of the chapter, we are interested in finding out whether there are differences in the composite knowledge-language profiles connected to answers and performances of students between JSS1 (Grade 7) versus JSS3 (Grade 9) in business transcripts.

Table 7.2.2 summarises the data for the business tests across grade levels.

Business studies: Grade levels results					
Knowledge-language profiles	Associated languages	JSS1 (Grade 7) 40 students % mean of answers (10 questions)		JSS3 (Grade 9) 20 students % mean of answers (5 questions)	
		60% & above scored on 6 number of questions	Below 60% scored on 4 number of questions	60% & above scored on 2 number of questions	Below 60% scored on 3 number of questions
Low semantic density profiles	More than one language	5 (50%)	4 (40%)	2 (40%)	1 (20%)
	Only one language	N/A	N/A	N/A	N/A
High semantic density profiles	More than one language	N/A	N/A	N/A	N/A
	Only one language	1 (10%)	N/A	N/A	2 (40%)

Table 7.2. 2 Summary of business tests across JSS1 (Grade 7) and JSS3 (Grade 9)

Table 7.2.2 indicates that the composite knowledge-language profile linked to best performance across grade levels in business lessons is low semantic density with more than one language.

From these findings, the question, “what composite knowledge-language profiles appear to best explain the performance of the students to a question across JSS1 (Grade 7) and JSS3 (Grade 9)?” has to be that it is low semantic density knowledge with more than one language.

7.1.6 Students of which school type benefit more from what knowledge-language profile in business?

This subsection examines the impact of different composite knowledge-language profiles in business lessons on students across two types of schools.

Table 7.2.3 summarises the data for the business tests across school types.

Business studies: school types results					
Knowledge-language profiles	Languages	Private schools (40 students) % mean of answers (10 questions)		Public schools (20 students) % mean of answers (5 questions)	
		60% & above scored on 7 number of questions	Below 60% scored on 3 number of questions	60% & above scored on 0 number of questions	Below 60% scored on 5 number of questions
		Low semantic density profiles	More than one language	7 (70%)	1 (10%)
	Only one language	N/A	N/A	N/A	N/A
High semantic density profiles	More than one language	N/A	N/A	N/A	N/A
	Only one language	N/A	2 (20%)	N/A	1 (20%)

Table 7.2. 3 Summary of business tests across private schools and public schools

Table 7.2.3 indicates that low semantic density with more than one language had a more positive impact on students in private schools than those in public schools.

These results indicate that the answer to the question, “what composite knowledge-language profiles appear to best explain the learners’ performance above and below 60% score in business lesson across private schools versus public schools?” has to be low semantic density knowledge with more than one language.

Given what preceding sections have shown regarding the impact of composite knowledge-language profiles in business and in science lessons separately, it should be interesting to compare both subjects now.

7.1.7 Comparisons of the overall composite knowledge-language profiles and performance in science versus business transcripts

In this section of chapter 7, we are interested in ascertaining the overall differences of the knowledge-language profiles associated with the percentage of the students getting the answers correctly between science and business transcripts, JSS1 (Grade 7) and JSS3 (Grade 9), and private schools and public schools transcripts.

Table 7.2.4 summarises the overall data for the science and business tests.

Overall differences: science versus business					
Knowledge-language-profiles	Languages associated with answers	Science (140 students) (35 questions)		Business (60 students) (15 questions)	
		60% and above scored on 15 number of questions	Below 60% scored on 20 number of questions	60% and above scored on 7 number of questions	Below 60% scored on 8 number of questions
Low semantic density profiles	More than one language	12 (34.3%)	7 (20%)	7 (46.7%)	5 (33.3%)
	One language	N/A	3 (8.6%)	N/A	N/A
High semantic density profiles	More than one language	N/A	3 (8.6%)	N/A	N/A
	One language	3 (8.6%)	7 (20%)	N/A	3 (20%)

Table 7.2. 4 Summary of overall science and business tests

Not surprisingly, Table 7.2.4 reveals that the low semantic density knowledge profiles with more than one language are associated with high percentage of the students getting the answers correctly. We observe that low semantic density knowledge profiles with more than one language account for a mean of 46.7% of students in business, falling under the higher percentage bracket, in contrast to a mean of 34.3% in science. There is a gap of 12.4%.

7.1.8 What are the overall differences in the composite knowledge-language profiles and performance in grade levels of science versus business transcripts?

Table 7.2.5 below reveals that the low semantic density knowledge profiles with more than one language are associated with better student performances. We observe that in JSS1 (Grade 7) low semantic density knowledge profiles with more than one language account for a mean of 50% of students in business, falling under the higher score bracket, in contrast to a mean of 40% in science. There is a gap of 10%. Likewise, in JSS3 (Grade 9), low semantic density knowledge profiles with more than one language account for a mean of 40% of students in business, falling under the higher score bracket, in contrast to a mean of 30% in science. There is a difference of 10%.

Table 7.2.5 below summarises the overall data for the grade level tests between science and business.



Overall Grade levels differences between science versus business									
Knowledge-language profiles	Language connected to answers	Science transcripts				Business transcripts			
		JSS1 (Grade 7) (60 students) % mean of answers (15 questions)		JSS3 (Grade 9) (80 students) % mean of answers (20 questions)		JSS1 (Grade 7) (40 students) % mean of answers (10 questions)		JSS3 (Grade 9) (20 students) % mean of answers (5 questions)	
		60% & above scored on 8 number of questions	Below 60% scored on 7 number of questions	60% & above scored on 7 number of questions	Below 60% scored on 10 number of questions	60% & above scored on 6 number of questions	Below 60% scored on 4 number of questions	60% & above scored on 2 number of questions	Below 60% scored on 3 number of questions
Low semantic density profiles	More than one language	6 (40%)	4 (26.7%)	6 (30%)	4 (20%)	5 (50%)	4 (40%)	2 (40%)	1 (20%)
	Only one language		1 (6.7%)		2 (10%)	N/A	N/A	N/A	N/A
high semantic density profiles	More than one language					N/A	N/A	N/A	N/A
	Only one language	2 (13.3%)	2 (13.3%)	1 (5%)	4 (20%)	1 (10%)	N/A	N/A	2 (40%)

Table 7.2. 5 Overall differences of test scores at grade levels between science and business studies

7.1.9 What are the overall differences in the composite knowledge-language profiles and performance in school types of science versus business transcripts?

Table 7.2.6 below shows that low semantic density knowledge profiles with more than one language are associated with better student performance. We notice that, in the private schools, low semantic density knowledge profiles with more than one language account for an average of 70% of students in business which fall under the higher score category, in contrast to a mean of 20% in science. There is a wide gap of 50%. Conversely, in the public schools, low semantic density knowledge profiles with more than one language account for an average of 53.3% of students in science scoring the answer correctly, compared to a mean of 0% in business.



Overall school types differences between science versus business									
Knowledge-language profiles	Language connected to answers	Science transcripts				Business transcripts			
		Public schools (60 students) % mean of answers (15 questions)		Private schools (80 students) % mean of answers (20 questions)		Public schools (20 students) % mean of answers (5 questions)		Private schools (40 students) % mean of answers (10 questions)	
		60% & above scored on 11 number of questions	Below 60% scored on 4 number of questions	60% & above scored on 6 number of questions	Below 60% scored on 15 number of questions	60% & above scored on 0 number of questions	Below 60% scored on 5 number of questions	60% & above scored on 7 number of questions	Below 60% scored on 3 number of questions
Low semantic density profiles	More than one language	8 (53.3%)	N/A	4 (20%)	8 (40%)	N/A	4 (80%)	7 (70%)	1 (10%)
	Only one language	N/A	2 (13.3%)	N/A	1 (5%)	N/A	N/A	N/A	N/A
high semantic density profiles	More than one language	1 (6.7%)	N/A	1 (5%)	1 (5%)	N/A	N/A	N/A	N/A
	Only one language	2 (13.3%)	2 (13.3%)	1 (5%)	5 (25%)	N/A	1 (20%)	N/A	2 (20%)

Table 7.2. 6 Overall differences of test scores at school types between science and business studies

As illuminating as it is, the picture we have just painted is not actually quite complete. Do the low semantic density profiles with more than one language produce the same effects as seen above, with or without the answers being repeated in different places of the lesson? It may be recalled from the sample Figures 7.1 and 7.2 that the answer to a particular question in the transcripts may occur once or more than once.

The next section will then deal with the factor of reinforcement in connection with the knowledge-language profiles and performance.

7.2 Knowledge-language profiles: the perspectives of frequency of answers and students performance.

This section is interested in finding the overall frequency of answers and performance of students across business lesson transcripts.

Table 7.3 shows how frequently answers are provided in the lessons alongside the corresponding and dominant knowledge profiles as well as how students performed.

Business lessons	Number of answers in the transcript	Dominant knowledge-language profiles	Languages connected to answers	% of students with correct answer
Business lesson 1 (20 students)				
Question 1	7 times	Low semantic density knowledge-language profiles (SD-)	More than one language	35% students with correct answer
Question 2	1 time	High semantic density knowledge-language profiles (SD+)	Only one language	25% students with correct answer
Question 3	5 times	Low semantic density knowledge-language profiles (SD-)	More than one language	15% students with correct answer
Question 4	10 times	Low semantic density knowledge-language profiles (SD-)	More than one language	45% students with correct answer
Question 5	3 times	Low semantic density knowledge-language profiles (SD-)	More than one language	5% students with correct answer
Business: lesson 2 (20 students)				
Question 1	9 times	Low semantic density knowledge-language profiles (SD-)	More than one language	100% students with correct answer

Question 2	12 times	Low semantic density knowledge-language profiles (SD-)	More than one language	100% students with correct answer
Question 3	15 times	Low semantic density knowledge-language profiles (SD-)	More than one language	95% students with correct answer
Question 4	18 times	Low semantic density knowledge-language profiles (SD-)	More than one language	85% students with correct answer
Question 5	7 times	Low semantic density knowledge-language profiles (SD-)	More than one language	95% students with correct answer
Business: lesson 3 (20 students)				
Question 1	9 times	Low semantic density knowledge-language profiles (SD-)	More than one language	90% students with correct answer
Question 2	2 times	High semantic density knowledge-language profiles (SD+)	Only one language	55% students with correct answer
Question 3	9 times	Low semantic density knowledge-language profiles (SD-)	More than one language	65% students with correct answer
Question 4	9 times	Low semantic density knowledge-language profiles (SD-)	More than one language	0.0% students with correct answer
Question 5	13 times	High semantic density knowledge-language profiles (SD+)	Only one language	35% students with correct answer

Table 7.3 Knowledge-language profiles, frequency of answers and percentage of correct answers

Table 7.3 indicates that in transcript 3 question 1, for example, with content repetition of 9 times in low semantic density knowledge profiles with more than one language produced better results in the overall business transcripts.

From the Table 7.3 we have generated summary tables. Table 7.3.1 summarises the data for the business tests below.

Overall: business results					
Knowledge-language-profiles	Languages associated with answers	Number of times answers repeated (60 students)			
		Repeated 3 times and below (3 questions)		Repeated 4 times and more (12 questions)	
		60% and above scored on 0 number of questions	Below 60% scored on 3 number of questions	60% and above scored on 7 number of questions	Below 60% scored on 5 number of questions
Low semantic density profiles	More than one language	N/A	1 (33.3%)	7 (58.3%)	4 (33.%)
	Only one language	N/A	N/A	N/A	N/A
High semantic density profiles	More than one language	N/A	N/A	N/A	N/A
	Only one language	N/A	2 (66.7%)	N/A	1 (8.3%)

Table 7.3. 1 Summary of overall business tests

Table 7.3.1 enables us to provide a more nuanced account of the impact of knowledge-language profiles, especially the low semantic density profiles with more than one language. The table shows that much of the positive effects reported previously (in terms of questions on which greatest percentage of students getting the answer correctly) probably exist as a result of repetition or reinforcement of the material. When content corresponding to low semantic density profiles in more than one language is either not repeated or occurs three times at most, majority of student got the answer wrongly. However, when there were multiple (four or more) iterations of content in that same knowledge-language configuration, 60% of the students score answer correctly. With the alternative configuration, repetition of content does not appear to enhance poor performance.

At the beginning of this chapter, in section 7.1 we provided an example of a lesson excerpt for business as well as a graphic representation of its knowledge-language profile (semantic wave which belongs in the low semantic density profiles plus (+) more than one language). The profile showed nine iterations of content. This is the profile seen here as explaining the higher student performance. In that example, the relevant question to be answered was: ‘Explain two forms of business’. Sample correct answers provided by students included the following: Student a) **‘sole proprietorship – this is a kind of business that is own by one person; partnership, is a business set up by two or more people’**; and Student b)

‘partnership – is a business own by two or more people; sole proprietorship – is a business own by one person’.

Let us now attempt to disaggregate the overall effect of repetition of content in business lessons from the standpoint of grade levels and school types.

7.2.1 In business lessons, does repetition corresponding to particular knowledge-language configurations produce different effects across grade levels?

In Table 7.3.2 below, data from JSS1 and (Grade 7) and JSS3 (Grade 9) is used to answer the above question.

Table 7.3.2 summarises the data for the business tests across grade levels.

Grade levels: Business results									
Composi te knowled ge- language profiles	Languag es associat ed answers	Frequency of answers							
		JSS1 (Grade 7) (10 questions) 40 students				JSS3 (Grade 9) (5 questions) 20 students			
		Repeated below 3 times		Repeated above 4 times		Repeated below 3 times		Repeated above 4 times	
		60% and above scored on 0 numbe r of questio ns	Below 60% scored on 2 numbe r of questio ns	60% and above scored on 5 numbe r of questio ns	Below 60% scored on 3 numbe r of questio ns	60% and above scored on 0 numbe r of questio ns	Below 60% scored on 1 numbe r of questio ns	60% and above scored on 2 numbe r of questio ns	Below 60% scored on 2 numbe r of questio ns
Low semantic density profiles	More than one language	N/A	1 (10%)	5 (50%)	3 (30%)	N/A	N/A	2 (40%)	1 (20%)
	Only one language	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
High semantic density profiles	More than one language	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Only one language	N/A	1 (10%)	N/A	N/A	N/A	1 (20%)	N/A	1 (20%)

Table 7.3. 2 Summary of business tests across JSS1 (Grade 7) and JSS3 (Grade 9)

Table 7.3.2 indicates that the content repetition (above four) in low semantic profiles with more than one language produced better results at the JSS1 (Grade 7) level than at JSS3 (Grade 9) level.

7.2.2 In business lessons, does repetition corresponding to particular knowledge-language configurations produce different effects across school types?

In Table 7.3.3 below, data from private and public schools is used to answer the above question.

Table 7.3.3 summarises the data for the business tests across school types.

School types: Business results									
Composite knowledge-language profiles	Languages associated answers	Frequency of answers							
		Public schools (5 questions) 20 students				Private schools (10 questions) 40 students			
		Repeated below 3 times		Repeated above 4 times		Repeated below 3 times		Repeated above 4 times	
		60% and above scored on 0 number of question	Below 60% scored on 2 number of questions	60% and above scored on 0 number of questions	Below 60% scored on 3 number of questions	60% and above scored on 0 number of questions	Below 60% scored on 1 number of questions	60% and above scored on 7 number of questions	Below 60% scored on 3 number of questions
Low semantic density profiles	More than one language	N/A	1 (20%)	N/A	3 (60%)	N/A	N/A	7 (70%)	1 (10%)
	Only one language	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1 (10%)
High semantic density profiles	More than one language	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Only one language	N/A	1 (20%)	N/A	N/A	N/A	1 (10%)	N/A	1 (10%)

Table 7.3. 3 Summary of business tests across private schools and public schools

Table 7.3.3 indicates that the content repetition (above four) in low semantic profiles with more than one language produced better results at the private school, but not in the public school.

The findings we have seen so far have revealed where (in terms of grade level and school type) low semantic density profiles with more than three repetitions produced better results in business lessons. Let us now repeat the above disaggregation analysis for science lessons.

7.2.3 In science lessons, does repetition corresponding to particular knowledge-language configuration produce different effects across grade levels?

Table 7.4 below provides the data used to answer the above question. Table 7.4 shows how frequently answers are provided across science lessons alongside the corresponding and dominant knowledge profiles, as well as how students performed.

Science lessons	Number of answers in the transcript	Dominant knowledge-language profiles	Languages connected to answers	Percentage of students with correct answers
Science lesson 1 (20 students)				
Question 1	7 times	Low semantic density knowledge-language profiles (SD-)	More than one language	100% students with correct answers
Question 2	8 times	High semantic density knowledge-language profiles (SD+)	More than one language	40% students with correct answers
Question 3	2 times	Low semantic density knowledge- profiles (SD-)	More than one language	30% students with correct answers
Question 4	14 times	Low and high semantic density (SD-)	More than one language	55% students with correct answers
Question 5	7 times	Low semantic density knowledge-language profiles (SD-)	More than one language	100% students with correct answers
Science lesson 2 (20 students)				
Question 1	1 time	High semantic density knowledge-language profiles (SD+)	Only one language	15% students with correct answers
Question 2	14 times	Low semantic density knowledge-language profiles (SD-)	More than one language	25% students with correct answers
Question 3	10 times	High semantic density knowledge-language profiles	More than one language	35% students with correct

		(SD+)		answers
Question 4	3 times	High semantic density knowledge-language profiles (SD+)	Only one language	40% students with correct answers
Question 5	1 time	High semantic density knowledge-language profiles (SD+)	Only one language	35% students with correct answers
Science lesson 3 (20 students)				
Question 1	2 times	Low semantic density knowledge-language profiles (SD-)	Only one language	20% students with correct answers
Question 2	2 times	Low semantic density knowledge-language profiles (SD-)	Only one language	0.0% students with correct answers
Question 3	5 times	Low semantic density knowledge-language profiles (SD-)	More than one language	100% students with correct answers
Question 4	7 times	Low semantic density knowledge-language profiles (SD-)	More than one language	75% students with correct answers
Question 5	4 times	Low semantic density knowledge-language profiles (SD-)	More than one language	70% students with correct answers
Science lesson 4 (20 students)				
Question 1	9 times	Low semantic density knowledge-language profiles (SD-)	More than one language	30% students with correct answers
Question 2	1 time	High semantic density knowledge-language profiles (SD+)	Only one language	100% students with correct answers
Question 3	11 times	Low semantic density knowledge-language profiles (SD-)	More than one language	10% students with correct answers
Question 4	12 times	Low semantic density knowledge-language profiles (SD-)	More than one language	30% students with correct answers
Question 5	7	Low semantic density knowledge-language profiles (SD-)	More than one language	35% students with correct answers
Science lesson 5 (20 students)				
Question 1	6 times	Low semantic density knowledge-language profiles (SD-)	More than one language	75% students with correct answers
Question 2	16	Low semantic density knowledge-language profiles (SD-)	More than one language	80% students with correct answers
Question 3	5 times	Low semantic density knowledge-language profiles (SD-)	More than one language	60% students with correct answers
Question 4	7 times	Low semantic density knowledge-language profiles	Only one language	85% students with correct

		(SD-)		answers
Question 5	2 times	High semantic density knowledge-language profiles (SD+)	Only one language	65% students with correct answers
Science lesson 6 (20 students)				
Question 1	7 times	Low semantic density knowledge-language profiles (SD-)	Only one language	25% students with correct answers
Question 2	18 times	Low semantic density knowledge-language profiles (SD-)	More than one language	80% students with correct answers
Question 3	1 time	High semantic density knowledge-language profiles (SD+)	Only one language	45% students with correct answers
Question 4	2 times	High semantic density knowledge-language profiles	Only one language	15% students with correct answers
Question 5	7 times	Low semantic density knowledge-language profiles (SD-)	More than one language	95% students with correct answers
Science lesson 7 (20 students)				
Question 1	4 times	High semantic density knowledge-language profiles (SD+)	Only one language	35% students with correct answers
Question 2	1 time	High semantic density knowledge-language profiles (SD+)	Only one language	35% students with correct answers
Question 3	2 times	High semantic density knowledge-language profiles (SD+)	More than one language	65% students with correct answers
Question 4	5 times	Low semantic density knowledge-language profiles (SD-)	More than one language	80% students with correct answers
Question 5	1 time	High semantic density knowledge-language profiles (SD+)	Only one language	5% students with correct answers

Table 7.4 Knowledge-language profiles, frequency of answers and performance

Table 7.4 indicates that in transcript 2, question 1, for example, with content repetition of one time in high semantic density knowledge profiles with only one language produced poor results in the overall science transcripts.

From Table 7.4, we have generated summary tables. Table 7.4.1 below summarises how content repetition within specific knowledge-language profiles in science lessons impacts the performance of students.

Overall: science results					
Composite knowledge-language-profiles	Languages associated with answers	Numbers of answers repeated (140 students)			
		Repeated 3 times and below (13 questions)		Repeated 4 times and above (22 questions cases)	
		60% and above scored on 3 number of questions	Below 60% scored on 10 number of questions	60% and above scored on 12 number of questions	Below 60% scored on 10 number of questions
Low semantic density profiles	More than one language	N/A	1 (7.7%)	12 (54.5%)	7 (31.8%)
	Only one language	N/A	2 (15.4%)	N/A	1 (4.5%)
High semantic density profiles	More than one language	N/A	N/A	N/A	2 (9.1%)
	Only one language	3 (23.1%)	7 (53.8%)	N/A	N/A

Table 7.4. 1 Summary overall science tests

Table 7.4.1 shows that when answers were repeated four or more times and were encoded as low semantic density profiles with more than one language, 54.5% of the corresponding questions saw the students getting the answer correctly.

At the beginning of this chapter, section 7.1, we provided an example of a lesson excerpt for science as well as a graphic representation of its knowledge-language profile (high semantic flatline which belongs in the high semantic density profile category plus only one language and three iterations). This is the profile seen here as explaining the lower student performance. In that example, the relevant question to be answered was: “Differentiate between homogeneous mixtures and heterogeneous mixtures”. Sample wrong answers provided by students included the following: student a) **‘homogenous is a properties mixture why heterogeneous is a compound mixtures’**; student b) **‘homogenous mixture are chemical which are mixed physically while heterogeneous mixture are not mixed physically’**; and student c) as (i) **‘homogenous mixtures are mixtures of two element in a composition physically, (ii) heterogeneous mixtures are mixture of three or more element in a compound’**.

Let us now attempt to disaggregate the overall effect of repetition of the content in science lessons from the standpoint of levels and school types.

7.2.3.1 In science lessons, does repetition corresponding to particular knowledge-language configurations produce different effects across grade levels?

In Table 7.4.2 below, data from JSS1 (Grade 7) and JSS3 (Grade 9) is used to answer the above question. Table 7.4.2 summarises the data for the science tests across grade levels.

Grade levels: Science results									
Composite knowledge-language profiles	Languages associated answers	Frequency of answers (140 students)							
		JSS1 (Grade 7) (15 cases)				JSS3 (Grade 9) (20 cases)			
		Repeated below 3 times		Repeated above 4 times		Repeated below 3 times		Repeated above 4 times	
		60% and above scored on 3 number of questions	Below 60% scored on 2 number of questions	60% and above scored on 5 number of questions	Below 60% scored on 5 number of questions	60% and above scored on 0 number of questions	Below 60% scored on 8 number of questions	60% and above scored on 7 number of questions	Below 60% scored on 5 number of questions
Low semantic density profiles	More than one language	N/A	N/A	5 (33.3%)	4 (26.7%)	N/A	1 (5%)	7 (35%)	4 (20%)
	Only one language	N/A	N/A	N/A	N/A	N/A	2 (10%)	N/A	N/A
High semantic density profiles	More than one language	N/A	N/A	N/A	1 (6.7%)	N/A	N/A	N/A	1 (5%)
	Only one language	3 (20%)	2 (13.3%)	N/A	N/A	N/A	5 (25%)	N/A	N/A

Table 7.4. 2 Summary of business tests across JSS1 (Grade 7) and JSS3 (Grade 9)

Table 7.4.2 indicates that the content repetition (above four) which were encoded as low semantic density profiles with more than one language, produced better results at the JSS1 (Grade 7) level than at JSS3 (Grade 9) level.

7.2.3.2 In science lessons, does repetition corresponding to particular knowledge-language configurations produce different effects across school types?

In Table 7.4.3 below, data from private and public schools is used to answer the above question. Table 7.4.3 summarises the data for the science tests across school types.

School types: Science results									
Composite knowledge-language profiles	Languages associated answers	Frequency of answers (140 students)							
		Public schools (15 questions) 60 students				Private schools (20 questions) 80 students			
		Repeated below 3 times		Repeated above 4 times		Repeated below 3 times		Repeated above 4 times	
		60% and above scored on 2 number of questions	Below 60% scored on 4 number of questions	60% and above scored on 8 number of questions	Below 60% scored on 1 number of questions	60% and above scored on 1 number of questions	Below 60% scored on 6 number of questions	60% and above scored on 4 number of questions	Below 60% scored on 9 number of questions
Low semantic density profiles	More than one language	N/A	N/A	8 (53.3%)	N/A	N/A	1 (5%)	4 (20%)	9 (45%)
	Only one language	N/A	2 (13.3%)	N/A	N/A	N/A	N/A	N/A	N/A
High semantic density profiles	More than one language	N/A	N/A	N/A	1 (6.7%)	N/A	N/A	N/A	N/A
	Only one language	2 (13.3%)	2 (13.3%)	N/A	N/A	1 (5%)	5 (25%)	N/A	N/A

Table 7.4. 3 Summary of business tests across private schools and public schools

Table 7.4.3 shows that content repeated above four times and encoded as low semantic density profiles with more than one language, produced better results at the public school level than at the private school level.

Given this analysis, we observed that the knowledge-language configuration of repeated content that enhanced the number of students doing well was low semantic density profiles with more than one language, with repetition occurring more than four times. The knowledge-language configuration of repeated content that was not as impactful was high semantic density profiles with only one language and less than three iterations. With respect to grade levels, we also noticed that the knowledge-language configuration of repeated content that enhanced students' performance above 60% was low semantic profiles with more than one language, and repeated above four times, and the knowledge-language configuration of content repetition that enhanced the students' performance above 60% in school type is a low semantic density profile with more than one language, and repeated above four times.

7.3 Discussion of findings in relation to the literature

In this chapter, we saw repeatedly in science and in business lessons, across grade levels and school types that the configuration we referred to as low semantic density profiles with more than one language was generally associated with content that produced the higher student scores in assessment. In part, i.e. the ‘more than one language’ part, is consistent with findings on the research on classroom translanguaging. One of the advantages of classroom translanguaging, as understood in a general sense that also includes what is regarded as code switching, is that it deepens understanding and enhances students’ performances (Lewis, Jones & Baker, 2012; Simasiku, Kasanda & Smit, 2015; Mokgwathi & Webb, 2013; Norany & Osman, 2016; Hurst & Mona, 2017; Sefotho & Makalela, 2017; Nagy 2018; Sari & Sari 2019; Charamba 2019; Pollard 2002). For instance, in the context of code switching, Simasiku, Kasanda & Smit (2015), in Namibia, sought to determine whether the use of code switching in the classroom could enhance learners’ academic achievement. They deployed questionnaires to draw data from 12 teachers of English as a second language teaching in Grade 10 in the Caprivi Educational Region in order to investigate their perceptions on the use of code switching. Simasiku, Kasanda and Smit (2015:72) revealed that teachers agreed that “Code Switching enhanced learners’ learning of the English language, improved the way learners answered questions, and that it enhanced teaching and learning”. From Botswana, Mokgwathi and Webb (2013) also explored the educational effects of code switching, but in senior secondary school classrooms. Sourcing data from four government secondary schools, lessons were observed and audio recorded. They also administered close-ended questionnaires to the teachers and learners respectively. In the end, Mokgwathi and Webb (2013:117) noticed that “the teachers of content subjects (History: 71%, Biology: 79%; and Home Economics: 57%), generally agreed that code switching enhanced lesson understanding among the learners”. Earlier on, Pollard (2002:17), in the US, worked with students from both a bilingual classroom and an immersion classroom, and found that “code switching is a valuable strategy for students to convey their knowledge of subject matter”.

In the context of pedagogical translanguaging, Sefotho and Makalela (2017), in South Africa, examined the reading comprehension and rate of readers of Setswana, Sesotho and Sepedi in a Johannesburg school. Sefotho & Makalela (2017: 49) assessed 60 grade 4 to 6 elementary school children “through a battery of tests that were based on Curriculum-Based Measure” and reported that “the metadiscursive regimes of the Sotho continuum will,

inadvertently, enable both ontological and epistemic access for readers within their cultural competence”.

From Hungary, Nagy (2018) undertook a study aimed at identifying the strategies that students use in order to handle tasks at hand. To be able to obtain the research data, the author participated in the translanguaging activity with the students at the Faculty of Miercurea Ciuc, Sapientia University. A total of 15 students in three English classes of a first-year pre-intermediate programme were involved. Nagy (2018:50) noted that “the main advantages of these practices is that, by allowing learners to use their full linguistic potential within a planned activity in the classroom, they motivate weaker learners to engage more in learning activities”. Equally, as a result of poor academic achievement in Physics by students in most of South African schools, Charamba (2019) explored translanguaging practices focusing on a grade 11 classes in Sasolburg. The majority of the students were Sesotho language speakers. Charamba (2019) adopted a mixed-method approach to generate responses on the importance of language in learning and teaching in general and in Physics in particular. A total of 40 student participants were selected from which 28 were girls and 12 were boys. Two groups were formed: an experimental group and a control group. Pre-tests and post-tests were developed with 20 multiple choice questions. Addressing one of the research questions which aimed to determine “How does language affect the academic performance of eleventh-grade Physics students?”, Charamba (2019:11) reported that language can seriously affect the academic performance of Physics students, because “the effect size of 2.8 shows that 99% of participants in the control group were below the average person in the experimental group”. This means students in the experimental group had profited greater academically by the translanguaging approach than those in the control group who were taught monolingually. Similarly, Hurst and Mona (2017) worked with students with different language backgrounds in an extended degree in the humanities at the University of Cape Town, South Africa. The programme aimed to provide support for students who entered the university with low scores. Hurst and Mona (2017: 143) agreed that “the inclusion of translanguaging enables the students to make meaning across and between different language resources and to draw on cultural knowledge and resources”.

From chapter 2, it should be evident that research on classroom translanguaging has hardly gone beyond language to engage with the knowledge structures or types that are communicated in language, besides such dichotomies as presentational discourse versus explanatory discourse. So, by and large, research on translanguaging as pedagogy has

assumed that it is language strategy alone that explains advantages. As our data has shown, this is only partially true. We can say this because evidence from our overall data in science and business has shown that when the answers to a particular question were located in the high semantic density knowledge-language profiles with only one language, the achievement of the students was poor (science 25% of the students and business 25% of the students); but when the answers were located in the low semantic density knowledge-language profiles with more than one language, the number of questions on which the percentage of the students getting the answer correctly was high (average in science is 52%, while average in business is 46.7%). This clearly tells us that it is not language alone.

When we look at our overall data across grade levels, we find that within the low semantic density language-knowledge with more than one language, JSS1 (Grade 7) business accounted for the highest mean of 50% of students getting the answer correctly compared to a mean of 40% in JSS1 (Grade 7) science. Equally, the overall performance of students across school types showed that in private school, business accounted for a greater mean of 70% of the students getting the answer correctly in low semantic density language-knowledge profiles with more than one language, whereas in the public school, science recorded the majority of students performing better with a mean of 53.3%.

Following from the above findings, we can see that what researchers in the literature claim about the advantages of translanguaging as making things easier (Baker, 2011; Makalela, 2015; Childs, 2016; Carstens, 2016; Antia, 2017; Banda, 2017; Garcia & Otheguy, 2019) is not only a language matter, but it is also a knowledge structure matter. That is to say, it is not only language that explains whether learners understand a content subject better or not, but it is the way the knowledge is packaged, repackaged and unpacked (Maton, 2013, 2014; Waite, Maton, Curzon & Tuttiett, 2019; Clarence, 2016; Maton & Doran, 2017; Maton & Chen, 2020). Interestingly, in a study titled, *Unplugged Computing and Semantic Waves*, Waite, Maton, Curzon and Tuttiett (2019) analyzed “crazy characters” in a computer lesson to find out whether there were any effects of semantic profiles on the written lesson plan. Their analysis showed that “LCT provides a useful way to analyze lesson plans that gives insight into the way learning activities support students to unpack and repack new abstract concepts” (Waite *et al.*, 2019,(np)). This means that knowledge is one thing while language is another thing.

Currently, the translanguaging and code switching literature assumes that just because the teacher uses the official and non-official languages in the lesson, knowledge has therefore

been transmitted (Tavares, 2015; Ellen & Mona, 2017). Our data shows that, indeed, several languages have been used, but because the semantic density knowledge profile is on the high level, we see that the performance of the learner is not that good. Maton and Doran (2017) provided us with a translation device of semantic density in which they explained the complexity of knowledge practices in discourse. Taking classroom studies as an example, Maton and Doran (2017:48) make a point relevant to our findings when they observe that research generally has neglected “the forms taken by the knowledge practices being learned”. Similarly, they observe that the notion that “knowledge can be an object for study in its own right, one that possesses properties and powers with real effects, has been largely obscured” (Maton & Doran, 2017:48; Maton, 2013:10).

In spite of what we saw in the first part of the discussion, our data also showed that there were instances of more than one language use which did not produce the same effects. We saw that even when several languages were used, in what was called high semantic density knowledge profiles, the number of questions on which the percentage of students getting the answer correctly was lower than with the profile seen in the first part of this discussion. This is clearly an issue that has not quite been explained in the literature on translinguaging as classroom pedagogy, again because of the almost exclusive focus on language and neglect of knowledge. This is what Maton calls knowledge blindness (that is, limited engagement with knowledge structures). Maton and Chen (2020:36) ask, “Why are some students more successful than others?” Although Maton and Chen’s context is different from ours, the relevance of their answer is indisputable. Maton and Chen clearly understand where the problem lies:

the knowledge practices with which students are engaging, such as curriculum, pedagogy and assessment, were typically ignored or downplayed. From this perspective it mattered little what students are learning or how they are taught and assessed – they succeed or fail because of who they are or how they think or act. In short, studies analyze only knowers’ ways of knowing and overlook knowledge as an object of study. However, the tradition of work bringing knowledge back into the picture was also tending to become one-sided (Maton & Chen, 2020:36).

What Maton and Chen (2020) are saying about students not doing well in exams is that, the content of teaching, learning and assessment are only on the ‘knowers’ level, while

content knowledge is ignored by the teachers. In other words, in the context of the impact of translanguaging in teacher talk on students' performance, the point Maton and Chen seem to be making is that inattention to knowledge structures has made it difficult for traditional translanguaging research to explain data of the kind we referred to as high semantic density knowledge profiles with more than one language. What our study has shown is that, there is a need to go beyond knowledge-blindness (Maton, 2013, 2014; Maton & Doran, 2017). The claim that when many languages are used, the student can do better is completely based on a lack of analysis of the knowledge structure. LCT concepts bring "knowledge practices into view and enable their forms to be analyzed in relation to students' dispositions" (Maton & Chen, 2020:36). So, how can the claims in the literature (e.g. Ollerhead, 2019; Wang, 2019; Kalocsányiová, 2017; and French, 2016) make a conclusion about knowledge when they do not have the tools to analyze the knowledge?

For instance, with the growing linguistic complexity of classrooms around the world, Wang (2019) in China examined students' and teachers' practices of translanguaging in Chinese foreign language classrooms. Deploying three sources of data: a questionnaire survey of 201 students, three teachers' interviews, and three classroom observations, Wang (2019: 141) reported that "learning Chinese as a Foreign Language (CFL) within mixed linguistic groups, students often draw on their existing languages to learn". Also, Carstens (2016), in South Africa, explored the use of translanguaging as pedagogy for L2 acquisition and L1 development in a particular university where the official mediums of instruction are English and Afrikaans. Drawing his data from an academic literacy module (ALL 122), taught in English, 150 students taking the course responded to the questionnaires. Carstens (2016: 211) put forward that, "the majority of students in the English and the Afrikaans groups (...) indicated that translanguaging helped them to better understand the concept at hand". Likewise, in Australia, Ollerhead (2019) discussed the effects of classroom translanguaging in teaching across semiotic modes with multilingual learners. Deriving data from Metro Intensive English College, a specialised secondary school situated in a multiracial area of Sydney, the author focused on the classroom practices of one teacher, Rose. Ollerhead (2019:199) reported that the overall translanguaging practices in Rose's classroom, "enhanced literacy engagement through the recognition and celebration of students' linguistic and cultural funds of knowledge". Also, French (2016) studied students' multilingual resources by paying particular attention to the realities of multilingual practices within linguistically diverse classrooms in a private girls' secondary school in Adelaide,

Australia, and reported that “students used their multilingual resources to support their own learning,” (French, 2016: 309). Arising from the above, it is evident that what is obtained in the literature did not go beyond knowledge blindness, because the findings demonstrate a lack of engagement with the knowledge structures.

Again, one of the things that is hardly referred to in the literature when claims are being made on pedagogical translanguaging (Makonye, 2019; Makalela & Mgijima, 2016; Probyn, 2015, in South Africa) and classroom code switching (Grant & Nugen, 2017, in Vietnam; Mokgwathi & Webb, 2013, in Botswana; Gort & Sembiante, 2015, in US) is the factor of reinforcement / repetition. For instance, Mokgwathi and Webb (2013:117) examined the effects of code switching in senior secondary school classrooms and report that “CS could be used to repeat in Setswana an ambiguous concept to ensure learner comprehension”. By looking at the importance of repetition in the class, Mokgwathi and Webb (2013:117) agreed that “the repetition was deemed necessary as it provided clarification”. They added that, in a poetry lesson, “the teacher used the language which the learners understand better to assist them to understand the poem, by repeating in Setswana”.

In another study, Gort and Sembiante (2015) investigated the languaging practices of preschool bilingual co-teachers in a Spanish / English dual language programme at Sunnyvale Early Childhood Education Center, United States, focusing on one classroom where show-and-tell was a regular lesson activity. There were three Latina female teacher participants. The lead teacher was Ms. Katia, while Alba and Laura were collaborative teachers and native Spanish and English speakers. Digital video recordings and ethnographic fieldnotes were the instruments used for data collection. Having coded the data using Studiocode video analysis software, Gort and Sembiante (2015:15) noticed that when “one teacher articulated something related to the structure or organization of activity, for example, and the partner teacher recast, repeated, or revoiced the information in the other language”.

In South Africa, Probyn (2015) explored how translanguaging bridges discourses in Grade 8 science classrooms. She elected eight volunteer science teachers from eight schools. On the concept of repetition, Probyn (2015:232) says: “Teacher B shuttled between languages in eliciting from learners the key ideas, first in everyday language in isiXhosa, then in everyday language in English, then in scientific language in English supporting learners’ understanding in isiXhosa; then transferring that understanding to English; and at the same time, moving from everyday language to the language of science”. However, the nature of repetition in the literature does not address the effect on learning outcomes.

Our data revealed that, if we have composite knowledge-language profiles that involve the low semantic density knowledge-language profiles with more than one language but the answer occurred once or twice in the transcript, the performance of students was low (science mean of 14.3% of students getting the answer correctly, business mean of 33.3% of students getting the answer correctly). However, when that low semantic density knowledge-language profiles with more than one language, but the answer occurred more than three times, the percentage of the students getting the answer correctly was high (science 43.8%, business 58.3%). What this shows is that it is not just the fact of translanguaging that makes the learners understand, but it is also the number of times the answer is repeated. Arising from the literature, what our results in this chapter has shown is that what many studies in the literature on translanguaging are actually talking about, is actually when the low semantic knowledge profiles are used and then different languages are employed, that is when the understanding is better. These findings are in agreement with Antia (2017:101)'s assertion that "judgements of ease and difficulty were based on frequency of encounter of the term" by students in an examination.

Looking at literature on the effect of translanguaging on the learners' performance (e.g. Makonye, 2019; Makalela & Mgijima, 2016; Makalela, 2014; Schissel, Leung, López-Gopar & Davis, 2018; Charamba & Zano, 2019), there seems to be an absence of studies comparing its effects across disciplines, school types or grade levels. For example, in a task-based language assessment through continua of biliteracy lenses, Schissel, Leung, López-Gopar and Davis (2018) used a participatory model to create assessment instruments for pre-service English teachers in Oaxaca in Mexico. Two different tasks were administered to participants on reading and writing. The first task was to engage learners' English and Spanish languages resources, whereas the second task was controlled to English-only. Schissel *et al.* (2018) identified two findings from the study. Firstly, they noticed that "pre-service English teachers performed better on the multilingual task than the monolingual English task at a level of statistical significance", and secondly, that "integrating multilingual resources within assessment design can allow test-takers to demonstrate more complex or high-order thinking skills in the language they are learning" (Schissel *et al.*, 2018: 167).

From Zimbabwe, Makonye (2019) examined the effect of translanguaging in teaching and learning mathematics in four Grade 6 classes in two rural schools and revealed that "there was a marked improvement in the experimental classes, with a mean of 22.8% to 37.8% against the controls of 24% to 30.3% of learners who were taught in Shona. He added that

students who answered the question in the language of teaching and learning could not get the answer correctly.

Similarly, Makalela (2014) conducted an experimental study on the effectiveness of using a translanguaging practice among speakers of the Nguni language cluster who were learning Sepedi as a second language. Makalela (2014:208) told us that the “Posttest assessment scores show that there is a differential vocabulary gain between the control group (Mean of 50.2) and the experimental group (Mean of 86.8). This shows that the use of translanguaging techniques in the teaching of Sepedi in the experimental group as an additional language was successful. Makalela and Mgiijima (2016) corroborated Makalela (2014) study when they sought to find out the effects of translanguaging on teaching grade 4 learners. The authors argued that the “translanguaging intervention had a positive contribution to the participants’ performance in the two languages” (Makalela & Mgiijima, 2016: 93). Equally, Charamba and Zano (2019) investigated the impacts of translanguaging on the academic performance of science students and noticed that in a paired t-test, the results disclosed a statistically significant difference in the academic achievement of the two research groups in the posttest. For instance, the authors argue that “In cases where the language of instruction is different from the students’ home language, the performance graph tends to be skewed towards underachievement” (Charamba & Zano 2019: 14- 15). This means when answers appeared only in the official classroom language, the performance of the student was low. In our review of more than 80 studies on translanguaging in the literature, there did not seem to be studies taking a comparative view of the effects of translanguaging on learners in contexts such as different disciplines, school types or grade levels. This appears to be an area that has been largely ignored.

In terms of repetition, our data has shown that the frequency of occurrence of answers to a particular question can affect the performance of students. We observed that the composite knowledge-language profiles that involve the low semantic density profiles with more than one language, and the instances of the answer occurred between one and three times, the learners performed very poorly (a mean of 0.0%), but when the occurrences were more than three times, the performance of the students was relatively high at a mean of 73.3%. This finding is in agreement with Zhan, Guo, Chen and Yang (2018) in China when they examined the effects of repetition learning on associative recognition over time. They designed an fMRI experiment in which face-scene pairs were learned once (L1) or learned six times (L6). Selecting 37 students for the study, 20 students were randomly consigned to

group L6, while 17 students were placed in group L1. Students were given tasks in the scanner allowing for pairs of four retention intervals for an associative recognition ranging from 30 minutes, one day, one week and one month. Zhan *et al.* (2018:1) revealed that “the results showed that compared to learning once, learning six times led to stronger activation in the hippocampus”, suggesting that when stimuli are learned by repetition, they are remembered better and retained for a longer time (Zhan *et al.*, 2018).

In conclusion, it is evident from our data that, with a predominantly monolingual English lesson segment with a predominantly high semantic flatline, the students in the science and business classes did not do very well on the question relevant to that lesson segment. In contrast, in both science and business lesson segments where a semantic wave involving more than one language was the profile, all the students provided the correct answer to the question that corresponded to the lesson segment. Overall, knowledge profiles that substantially involve low semantic density and are multilingual were associated with better student performance.

Looking at the claims in the literature that in multilingual classroom talk, teachers use the official language for instructional discourse and the home language or the learners’ language to explain discourses is not correct. This chapter has shown that, in order to make the learners understand the lesson better, teachers need to make sure they blend the official classroom language and the learners’ languages and then repeat, because the results associated with this method of teaching are very good.

7.4 Summary of the Chapter

The overall goal of the chapter was to determine the impact of multilingual or translanguaged teacher-talk on the performance of students in assessment tasks. Specifically, the idea was to determine what effects different composite knowledge-language profiles in lessons had on students’ ability to answer questions based on taught content, and where (in terms of subject, school type and grade level) any effects were striking.

We argued that when answers were found to be within the low semantic density language-knowledge profiles, the students performed better than against answers occurring in the high semantic density knowledge-language profiles. The idea of repetition and/or reinforcement of answers to a given question in multilingual teacher-talk enhanced the performance of the

students. Monolingual language teaching was connected to low student performance, as evidenced from the results of our data.



CHAPTER 8: GENERAL CONCLUSION

8 Conclusions, Summary and Recommendations

This chapter focuses on the following points: (a) it recalls the reasons for and the objectives of the study, the theoretical framing as well as the methodology; (b) the major findings of the study and the contributions of the study to scholarship; (c) the limitations of the study and brief directions for further research.

8.1 Reason of Study

There were three major rationales or reasons for this study. The first is the view in the literature on code switching (Probyn, 2005; Salami, 2008; Jegede, 2012; van der Walt, 2009) and on translanguaging (Henderson & Ingram, 2018; Childs, 2016; Makalela, 2014, 2015; Garcia, 2009), claiming that there is compartmentalization of languages in multilingual classroom teacher-talk where language ‘a’ is used for the instructional discourses and language ‘b’ is used for explanatory discourses. The second is that the theoretical or analytical basis for multilingual classroom discourses has been narrowly focused on code switching and, increasingly, translanguaging. As a result, a number of other potentially interesting theoretical frameworks have not really been used and that has limited the kind of insight we can gain. As Lin (2013) attests, in much of the work on talk in multilingual classrooms, code switching is frequently drawn upon, and other potentially interesting theories are neglected.

The third reason is that in many multilingual environments, the language policy governing teaching and learning continues to promote a culture of monolingualism in the so-called official languages which does not take into account the interest of the learners and how they could benefit from other language arrangements. This is what Gogolin (1997: 41) refers to as “monolingual habitus: the deep-seated habit of assuming monolingualism as the norm in a nation”, ignoring that learners may be better served by other arrangements.

It is based on the above reasons that this study set out to examine the interface of language and knowledge in multilingual teacher-talk in science and business studies classrooms in North Eastern Nigeria.

To this end, we employed new frameworks into the existing scholarship on the subject. Thus, in this study, we employed Legitimation Code Theory (LCT), Translanguaging and Terminology Theory. LCT allowed us to encode and model the knowledge that was transmitted in the sequences of the teacher talk. Terminology Theory allowed us to identify knowledge that is being conveyed in specialized terms in multilingual teacher-talk. We further employed translanguaging to model the languages in the flow of teacher talk.

To enable us to unravel the patterns of languages used in multilingual classroom teacher-talk, we collected data from 12 teachers from four schools (three teachers from each school, two science teachers and one business teacher in each school). The schools selected comprised of two private schools and two public schools. There were three sources of data adopted for the study: a) transcripts from audio recording of 12 different lessons; and b) achievement test conducted on 240 students in the four schools.

Our concern was to find out to what extent the claim in the literature on functional allocation of language holds with respect to multilingual teacher-talk.

Using a combination of both qualitative and quantitative methods, we sought to address the following questions which, though important, have not often been posed on account of the limited engagement in the research on classroom code switching and translanguaging: a) to what extent is it appropriate to claim that there is a functional allocation of language in multilingual teacher-talk (in which language 'a' is used for presentational knowledge and language 'b' for explanatory knowledge?); b) what encodings of knowledge occur in a set of science and business studies lessons?; c) given patterns of knowledge dynamics (e.g. semantic waves, semantic flatline both high and low, downward shift and upward shift) emerging from LCT, what knowledge profiles are observable and how does language use in multilingual teacher-talk map onto these patterns?; d) how are any observed differences in the composite knowledge-language profiles to be explained?; and e) what effects do various language-knowledge profiles have on students' understanding of the lesson and on their demonstration of their knowledge?

8.2 Findings

This section summarises the results obtained from our study. The first research question dealt with the extent to which the very wide claim of functional allocation of languages in multilingual teacher-talk was accurate. Our quantified data showed that it is not always the

case that the official classroom language (English) is used for introductory discourses and the non-official classroom languages are used for explanatory discourses.

In science lessons, our data shows that 91.1% of segments presenting core content were in English, and 8.9% of such segments were in a combination of Hausa and Fulfulde. In business lessons, the figures for languages used for presenting core content were: English 95.5%; Hausa / Fulfulde 4.5%.

Looking at our data the other way round, that is, languages used for explanatory discourses (to simplify core content), we found the following percentages in science lessons: English (19.4%), Hausa/Fulfulde (45.9% / 34.7% = 80.6%). The figures for business lessons are: English (41.2%), Hausa/Fulfulde (33.3% / 25.5% = 58.8%).

While English is dominant in presentational science discourses, we also observed that Hausa / Fulfulde are also used. We also observed that English has a higher percentage in business lessons and that Hausa / Fulfulde as languages of presentational discourses have a higher percentage showing in science lessons compared to business lessons. With respect to explanatory discourses, our data shows that this function is not only reserved for Hausa / Fulfulde. In fact, English still has the bigger share.

Our second research question sought to determine how knowledge in both science and business lessons was encoded, the reference being to the LCT codes of semantic density (SD+, SD-). This question enabled us to determine how frequently knowledge expressed in English was SD+ and how frequently knowledge expressed in Hausa/Fulfulde was SD-. The reverse was also of interest: how frequently knowledge expressed in English was SD- and expressed in Hausa / Fulfulde was SD+.

In the science lessons, we found that knowledge items encoded as SD+ amounted to 94.5% of all knowledge items in English, whereas items encoded as SD- amounted to 21.4% of all the items. For Fulfulde / Hausa, SD+ and SD- accounted, respectively, for 5.5% and 85.5% of knowledge items expressed in these languages.

In business, the picture was as follows: for English, knowledge items encoded as SD+ amounted to 95% of all knowledge items, whereas items encoded as SD- amounted to 30.9% of all the items. For Fulfulde / Hausa, SD+ and SD- accounted, respectively, for 5.1% and 69.1% of knowledge items expressed in these languages.

From another angle, these findings show that the knowledge basis on which the association is frequently made between English and presentational discourses is not as

accurate as widely assumed. The findings also suggest what is sometimes left out in data presented and analyzed in many studies. Our findings show that assumptions about English being associated with very dense knowledge and local languages with less dense knowledge are not sufficiently nuanced. The analyses in many studies can be seen as selective and intended to conform to a particular framework, rather than to the reality that knowledge encoded in English can be as less semantically dense as the type of knowledge believed to be conveyed in local languages. On the other hand, we see that knowledge expressed in local languages is not always less dense semantically as is assumed.

Furthermore, our findings show that a discussion of which knowledge is semantically dense / not dense, and communicated in what language, may also be determined by the discipline. We saw that business had less semantically dense knowledge (138 SD+) than science (273 SD+), and therefore distinguishing between English and Hausa / Fulfulde on the basis of the high semantic density of knowledge conveyed, may not be as meaningful as in a science lesson.

Our third research question sought to use visualization of knowledge profiles (as proposed in LCT semantics) to which languages are mapped to interrogate the claim of functional allocation of languages (FAL). In the context of multilingual teacher-talk, FAL would suggest that, in profiles such as semantic waves and downward shifts, English would typically be in the top positions of the profiles to which Hausa / Fulfulde are excluded, and that in the lower end of the profiles the opposite would obtain. Also, if FAL were always correct in multilingual teacher-talk, we would not expect to find knowledge sequences modelled as high flatlines to be in Hausa / Fulfulde, or for low flatlines to be in English.

In the business lessons, we found that in the 35.7% cases of knowledge sequences modelled as semantic wave, it is in 23.2% of the cases that English exclusively occupied the peaks. For downward shift, of the 5.4% cases in business, English did not occupy any position of the cases. English then accounted for 44.1% of the valley positions in semantic waves. On the other hand, Hausa / Fulfulde occupied the valley positions in 55.9% of the cases of semantic waves and 5.3% of the cases of downward shifts. For flatlines (high and low), of the 21.4% cases of high flatline, English occupied the peak with 21.4% (that is 100%) of the cases. English also accounted for 5.3% of the low flatline. On the other hand, Hausa / Fulfulde occupied the position in low flatlines with 8.8% cases.

For science, the picture is as follows: the peak of semantic waves was occupied with 16.7% of the cases by English and 5.2% of the cases by Hausa / Fulfulde. The valleys of the semantic waves were occupied as follows: English 48%, and Hausa / Fulfulde 52%. For downward shift, the positions were occupied as follows: English 5.2% of the cases, Hausa / Fulfulde also with 5.2% of cases. For high flatlines, of the 26.3% cases, English occupied the positions with 23.2% of the cases. English also occupied 2.1% positions of low flatlines. Hausa / Fulfulde accounted for 2.1% cases of high flatline and 17.7% of low flatline.

As translanguaging and code switching literature view that any information presented in the non-official classroom languages is automatically an explanatory knowledge, we regard this as knowledge being addressed from the viewpoint of language. Our data have however shown that there are instances of the non-official classroom languages that are high semantic density (see section 6.2). By using the knowledge profiles, we notice where we have semantic waves or low semantic flatlines, the languages that are employed is the official language of the classroom (English), and where we have semantic waves, high semantic flatlines and upward shifts, the languages that are used are home languages.

This took us to where we addressed the fourth research question on the differences in the composite language-knowledge profiles observed in the third research question. We observed great differences in the composite language-knowledge profiles across science and business lessons.

In JSS1 (Grade 7) lessons, we noticed that, in the 33.3% of cases of knowledge sequences modelled as semantic wave, in 26.2% cases English exclusively occupied the peaks. For downward shift, of the 10.8%, English did not occupy any position. English then accounted for 41.7% of the valley positions in semantic waves. On the other hand, Hausa / Fulfulde occupied the valley positions with 58.3% of the cases of semantic waves. For flatlines (high and low), of the 15.4% cases of high flatline in JSS1 (Grade 7), English exclusively occupied the peak with 13.8% of the cases. English also accounted for 10.8% of the upward shift. Hausa / Fulfulde exclusively occupied the positions in low flatline with 23.1% of the cases.

For JSS3 (Grade 9), we saw the following picture: the peak of semantic waves was exclusively occupied by English with 26.1% of the cases. The valley of the semantic wave was occupied as follows: English 51.1%, and Hausa / Fulfulde 48.9%. For downward shift, peak positions were occupied as follows: English 4.5% of the cases, and Hausa / Fulfulde 4.5% of cases. For high and low flatlines, of the total 23.95% of cases, English occupied the

positions of 20.5% of the cases of high flatline, and Hausa / Fulfulde accounted for 17.0% of cases of low flatline.

Looking at how the type of school affected knowledge-language profiles, for private school lessons, in the 35.2% of cases of knowledge sequences modelled as semantic wave, English exclusively occupied the peaks with 25.7% of the cases. For downward shift, English only occupied 1.9% of the cases. English also accounted for 45.8% of the valley positions in semantic waves. Hausa / Fulfulde occupied the valley positions in 54.2% of cases of semantic waves. For flatlines, from the 27.6% cases of high flatline, English occupied the peak with 22.9% of the cases. English further accounted for 10.5% of the 11.4% of upward shift. On the contrary, Hausa / Fulfulde exclusively occupied the position in 11.4% of cases of low flatlines.

For the public schools, the picture was revealed as follows: the peak of semantic waves was occupied with 29.2% of the cases by English and 6.3% of the cases by Hausa / Fulfulde. The position of valleys of semantic wave was 52% in English and 48% in Hausa / Fulfulde. From the 20.8% of downward shift, English occupied the positions with 8.3% of the cases, and Hausa / Fulfulde 8.3%. For flatlines, of the 12.5% cases of high flatlines, English occupied the positions with 10.4% of the cases, and Hausa / Fulfulde accounted for 16.7% of cases in low flatline.

In fact, many studies have not investigated how the above factors, alongside the subject which we saw earlier, shape multilingual teacher-talk.

Our fifth research question sought to determine the actual impact of multilingual talk on learners, a topic that is not frequently undertaken. Our focus on knowledge structures and iterations, not just on languages, was very revealing. The following was found to make students perform well on tasks based on the lessons they had been taught (leaving out prior knowledge, interest, and so on, as possible confounding factors): (1) the structure of the knowledge in the answers as contained in the lesson transcripts; and (2) the number of iterations of the answers. It was not primarily about the language. For instance, we saw cases where Hausa / Fulfulde was used for the segment of a lesson that had the answer to a question, and the students answered incorrectly, just as we saw English being used and the students also answering correctly. What appeared to determine the performance of the students was whether the knowledge in the lesson was coded SD+ or SD-, irrespective of which language or how many languages were used.

In business assessment tasks, 8.2% of the number of answers marked as wrong came from lesson segments encoded predominantly as SD+, irrespective of the language or languages used. On the other hand, 85.0% of the number of answers marked as correct came from segments encoded predominantly as SD-, again irrespective of language or languages.

In science assessment tasks, 39.2% of the total number of answers marked as wrong came from lesson segments encoded predominantly as SD+, irrespective of the language or languages used. We noticed 60.8% of the total number of answers marked as correct came from segments encoded predominantly as SD-, again irrespective of language or languages.

In other words, it is not primarily the functional allocation of languages that explains perceptions or empirical claims of enhanced student understanding.

Repetition, or the number of iterations, together with knowledge structure, was an important factor that appeared to have further minimized the importance accorded to languages. In science, we saw that when low semantic density content relevant to an answer was presented more than three times, irrespective of languages, the students' mean performance on relevant questions stood at 83.6%. When the low semantic content was presented three times or fewer, the mean performance on corresponding questions stood at 42.8%.

For business, we also noticed that when low semantic density content relevant to an answer was presented more than three times, regardless of languages, the mean performance of the students stood at 70.6%. On the contrary, when the low semantic content was presented three times or fewer, the mean performance on corresponding questions stood at 26.3%.

8.3 Contributions of the Study

In this thesis, there are eight unique contributions that have been made. We have made **three** contributions to **theory**, **three** to **methods**, and a further **two** to educational policy making and implementation.

8.3.1 Contributions to Theory

Before our study, in much of the work on classroom discourses on teacher-talk, the emphasis was on language and minimally on knowledge communicated in this language. For instance, there have been claims about functional allocation of language (that is, presentational discourse is expressed in the official classroom language, and the explanatory

discourse is expressed in the non-official classroom language). The distinction between presentational and explanatory discourse is not really based on an engagement with knowledge structures and reflects a pre-theoretical approach to knowledge. With our study, drawing on LCT Semantics, we have a way of coding knowledge that is supported by theory. LCT has been able to provide us the basis for unpacking different kinds of knowledge by using semantic density (SD), which makes it possible for us to code kinds of knowledge. Such coding of knowledge makes it possible to conduct knowledge-structure-based studies of academic classroom discourses.

Before our study, studies on multilingual classroom teacher-talk have not traditionally attended to factors other than perceived pedagogical strategy that shape the nature of talk. As a result, the role of disciplines, types of school, or levels of study have not traditionally been factored in. Drawing on the LCT Semantics, we have a tool for determining how the function of disciplines, school types, and grade levels are accommodated in multilingual teacher-talk.

Prior to this study, there was no theory of visualization of the flow of knowledge and language in multilingual teacher-talk in the classroom. As a result, we could not really see how language and knowledge were interacting on a broad scale. All that we typically had were excerpts in studies that made it difficult to visualize the dynamics of language and knowledge. Drawing on the LCT Semantic profiles, and extending them to incorporate language, we have been able to develop a tool for visualizing knowledge and language in multilingual teacher-talk.

8.3.2 Contribution on Method

First, to the best of our knowledge, there have not been studies that approach LCT from a quantitative perspective, especially on multilingualism. Research frameworks such as LCT and translanguaging have been mainly based on text analysis, which may be employed to understand certain patterns of language under investigation. However, this study has shown that information in the classroom using LCT can be scrutinized quantitatively to determine the pattern of language use over time and relate such figures to the corresponding classroom talks. Both LCT and translanguaging have made the classroom discourse better.

Second, prior to this research, studies on multilingualism have been largely approached descriptively using a range of social science theories. For instance, where quantitative data is used, it is usually obtained from questionnaires drawn from teachers, students or school

administrators' perceptions on the use of multiple languages in the classrooms. The present research is unquestionably the first in which an overview of multilingual classroom talk is given based on quantifiable empirical data in teacher talk using LCT Semantics.

Third, in the area of teaching practice, prior to this study, the literature has shown that teachers in various disciplines and in different countries use the official language to introduce the topic and use the home language or first language to explain. This study has shown how teacher talk produces positive effects or enhances students' learning. It has shown the important role of repetition, whether operating in the form of duplicating multilingualism (i.e. restating the information in another language or languages), or fragmentary multilingualism (i.e. some selected parts of information are translated into an additional language). This is significant in light of questions that have been posed in the literature on how to present translanguaging in teacher-training.

8.3.3 Contribution to educational policy making and implementation

First, in many of the studies on translanguaging and code switching, generally, there has always been a monolingual language policy in teaching and learning. Most learners are migrants children due to either war (civil or insurgency), natural disasters (flood, earthquake, famine), and marriage. Most of learners who are displaced from their ancestral homes are actually deprived from accessing fair education. With our study, a new framework for developing new policy and guidelines that can accommodate multilingual teaching with LCT was developed.

Second, the National Policy on Education emphasizes that monolingual English should be used as medium of instruction beyond the first three years of schooling. This study, through its attention to the impact of multilingual teacher-talk on students, has shown that classroom multilingualism can be beneficial, even while cautioning on too much of a focus on language. The study has now opened up the opportunity for policy enforcers (school inspectors and administrators) to see the benefits of allowing the use of multiple languages in teaching and learning.

8.3.4 Future Research

While the analysis in this study has been based on the segments of multilingual teacher-talk in the classrooms, generally, in the two sites / environments of our study, the use of Hausa and Fulfulde by the students is mainly in the spoken form. We do not know what will happen in an environment like Ile Ife, South-West, Nigeria, where the learner is dealing with only Yoruba as non-official classroom language, and the knowledge of the language is much deeper. It is important to replicate this type of study where both the teacher and the learners have very deep knowledge of the non-official classroom language and where it is perhaps used more frequently in academic matter than my study sites.

Our study is based on junior (high) levels. Future studies may want to also explore multilingual teacher-talk at senior (high) levels or higher education institutions (universities / colleges). At the junior level, the concepts are relatively less technical, but at the university level, the concepts become relatively more technical.

This study is limited to four schools, two content subjects (science and business), 12 teachers in 12 classrooms and 240 student participants. Future study should focus on much larger data sources, including more participants, and different content subjects covering more schools and classrooms.



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Appendix

Appendix A: Ethical clearance



OFFICE OF THE DIRECTOR: RESEARCH RESEARCH AND INNOVATION DIVISION

Private Bag X17, Bellville 7535
South Africa
T: +27 21 959 2988/2948
F: +27 21 959 3170
E: research-ethics@uwc.ac.za
www.uwc.ac.za

29 May 2017

Mr H Bassi
Linguistics
Faculty of Arts

Ethics Reference Number: HS17/3/20

Project Title: Multilingual teacher talk in secondary school classrooms in Yola, North east Nigeria: Exploring the interface of language and knowledge using legitimation code theory and terminology theory.

Approval Period: 24 May 2017 – 24 May 2018

I hereby certify that the Humanities and Social Science Research Ethics Committee of the University of the Western Cape approved the methodology and ethics of the above mentioned research project.

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval. Please remember to submit a progress report in good time for annual renewal.



The Committee must be informed of any serious adverse event and/or termination of the study.

A handwritten signature in black ink that reads 'Josias'.

Ms Patricia Josias
Research Ethics Committee Officer
University of the Western Cape

PROVISIONAL REC NUMBER - 130416-049

Appendix B: Permission to conduct research from school Administrators

 **GOVERNMENT GIRLS SEC. SCHOOL YOLA**
JUNIOR SECTION
P.M.B. 2012 YOLA
ADAMAWA STATE 

Our Ref:..... Your Ref:..... Date.....

29th June, 2017

Mr.Madu Musa Bassi
Linguistic Department
University of Western Cape
Modderdam Road
Private Bag x17, Bellville, 7535
South Africa

Dear Sir,

PERMISSION TO CONDUCT RESEARCH

Sequel to your letter seeking permission to conduct aresearch on Multilingual Teacher-Talk in Secondary Schools in North-east, Nigeria and particularly in Government Girls' Secondary School, Yola (Junior Section) in Grade 7 (JSS1) and Grade 9 (JSS3), the school wishes to convey approval to your request.

We hope our identity and that of our teachers and students will be kept confidential.

Thank you.

Yours faithfully
PWANSON EKWONKE
Principal
08057443142



ALIYU MUSDAFA COLLEGE (JUNIOR)

P.M.B. 2040, YOLA
ADAMAWA STATE
E-mail: amcyola@yahoo.co.uk

TEL: 075-634245

Our ref _____ Your ref _____ Date 12 June, 2017

Mr. Madu Musa Bassi,
Linguistics Department
Faculty of Arts
University of the Western Cape,
South Africa.




ACCEPTANCE TO CONDUCT RESEARCH

The above named college had accepted your request to conduct research titled Multi-lingual Teacher Talk in Secondary School Classrooms in Yola, North-East Nigeria.

The college wishes you a fruitful and successful work.
Thanks.

PRINCIPAL
ALIYU MUSDAFA COLLEGE (JUNIOR)
YOLA
Sign _____ Date _____ Yours faithfully,


Muhammad Buba Bindir
(Principal)



www.concordiacollegeyola.org
for Quality Education

Tuesday, 27th June, 2017

Mr. Madu Musa Bassi,
University of the Western Cape,
Modderdam Road,
Private Bag x17, Bellville, 7535,
South Africa.

Dear Sir,

ACCEPTANCE TO CONDUCT RESEARCH

Referring to your letter seeking to conduct a research on Multilingual Teacher Talk in Secondary School Classrooms in Yola, Northeast Nigeria with emphasis on Grade 7 (JSS1) and Grade 9 (JSS3), the College wishes that you treat this correspondence as an acceptance of your request.

We hope that you will keep the study confidential and that our identity and that of our teachers and students during lessons and in administered tests will not be disclosed. We also hope to get a copy of the study at the end of the research.

Please accept our congratulations while we wish you a productive time with the College.

Yours faithfully,

Martin J. Kimnaton
Principal



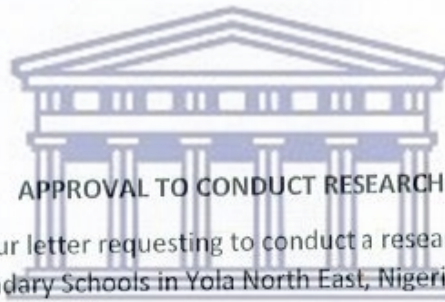
YOLA MODEL SCHOOL

GABON PEGI
P.O. BOX 3432, YOLA TOWN
ADAMAWA STATE

4th July, 2017.

Madu Musa Bassi
Linguistics Department
University of the Western Cape
Modderdam Road
Private Bag X17, Bellville, 7535
South Africa.

Dear Sir,



APPROVAL TO CONDUCT RESEARCH

With reference to your letter requesting to conduct a research on Multi Lingual Teacher-talk in Secondary Schools in Yola North East, Nigeria with emphasis on Grade 7 (JSS1) and Grade 9 (JSS 3) in Science and Business Studies, the school is happy to inform you of our acceptance to conduct your research.

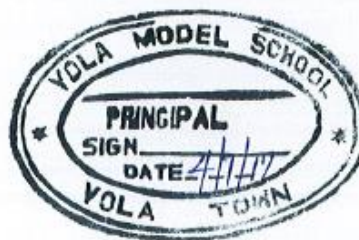
We are also happy to understand that the identity of our participating teachers and students during the lessons and the tests will not be disclosed.

Congratulations.

Yours' faithfully


Enyi Edmond

Principal



Appendix C: Parental consent form (sample)

FACULTY OF ARTS
Linguistics Department

University of the Western Cape
Robert Sobukwe Road
Private Bag X17, Bellville, 7535
South Africa
Tel: +27 (021) 959-2978/2380
Supervisor: Professor B.E Antia
Email: bantia@uwc.ac.za
8th May, 2017

Parent/Guardian Consent Form

Title of Research project: Multilingual teacher talk in secondary school classrooms in Yola, Northeast Nigeria: exploring the interface of language and knowledge using Legitimation Code Theory and Terminology Theory

I declare that I have read and understood the attached information sheet explaining the above research. I understand that as part of the research my child/ward will answer a few questions in business studies and science and that some lessons will be recorded. I have obtained all the clarification I needed.

I agree for my child/ward to participate in the study, should she/he wish to. I understand that my child/ward may withdraw or I can withdraw my child/ward from the study at any time without giving a reason and without fear of negative consequences.

Name of Parent/Guardian.....*Sahim Abubakar*
Name of child/ward.....*Idris Abubakar*
Signature of Parent/Guardian.....*[Signature]*
Date.....*18-06-2017*

UNIVERSITY of the
WESTERN CAPE



UNIVERSITY of the
WESTERN CAPE

FACULTY OF ARTS

Linguistics Department


University of the Western Cape
Robert Sobukwe Road
Private Bag X17, Bellville, 7535
South Africa
Tel: +27 (021) 959-2978/2380
Supervisor: Professor B.E Antia
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I agree for my child/ward to participate in the study, should she/he wish to. I understand that my child/ward may withdraw or I can withdraw my child/ward from the study at any time without giving a reason and without fear of negative consequences.

Name of Parent/Guardian..... JAPHSEIH AKILA
Name of child/ward..... DWASATO AKILA
Signature of Parent/Guardian..... 
Date..... 17 JUNE 2017

UNIVERSITY of the
WESTERN CAPE



UNIVERSITY of the
WESTERN CAP

A place of quality, a place to grow, from hope to action through knowledge

FACULTY OF ARTS

Linguistics Department

University of the Western Cape
Robert Sobukwe Road
Private Bag X17, Bellville, 7535
South Africa
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Supervisor: Professor B.E Antia
Email: bantia@uwc.ac.za
8th May, 2017

Parent/Guardian Consent Form

Title of Research project: Multilingual teacher talk in secondary school classrooms in Yola, Northeast Nigeria: exploring the interface of language and knowledge using Legitimation Code Theory and Terminology Theory

I declare that I have read and understood the attached information sheet explaining the above research. I understand that as part of the research my child/ward will answer a few questions in business studies and science and that some lessons will be recorded. I have obtained all the clarification I needed.

I agree for my child/ward to participate in the study, should she/he wish to. I understand that my child/ward may withdraw or I can withdraw my child/ward from the study at any time without giving a reason and without fear of negative consequences.

Name of Parent/Guardian.....*MR. HENRY ALPHONSUS*
Name of child/ward.....*Meloni Alphonsus*
Signature of Parent/Guardian.....*[Signature]*
Date.....*23rd June 2017*

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WESTERN CAPE



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WESTERN CAPE

A place of quality, a place to grow, from hope to action through knowledge

FACULTY OF ARTS

Linguistics Department

University of the Western Cape
Robert Sobukwe Road
Private Bag X17, Bellville, 7535
South Africa
Tel: +27 (021) 959-2978/2380
Supervisor: Professor B.E Antia
Email: bantia@uwc.ac.za
8th May, 2017

Parent/Guardian Consent Form

Title of Research project: Multilingual teacher talk in secondary school classrooms in Yola, Northeast Nigeria: exploring the interface of language and knowledge using Legitimation Code Theory and Terminology Theory

I declare that I have read and understood the attached information sheet explaining the above research. I understand that as part of the research my child/ward will answer a few questions in business studies and science and that some lessons will be recorded. I have obtained all the clarification I needed.

I agree for my child/ward to participate in the study, should she/he wish to. I understand that my child/ward may withdraw or I can withdraw my child/ward from the study at any time without giving a reason and without fear of negative consequences.

Name of Parent/Guardian... ALH. GIDADO BELLO

Name of child/ward... AISHATHU BELLO

Signature of Parent/Guardian... 

Date... 20th JUNE 2017

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WESTERN CAPE



UNIVERSITY of
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Appendix D: Assent form for minors (sample)

FACULTY OF ARTS
Linguistics Department

University of the Western Cape
Robert Sobukwe Road
Private Bag X17, Bellville, 7535
South Africa
Tel: +27 (021) 959-2978/2380
Supervisor: Professor B.E Antia
Email: bantia@uwc.ac.za,
8th May, 2017

ASSENT FORM FOR MINORS

Title of Research Project: Multilingual teacher-talk in secondary school classrooms in Yola, Northeast Nigeria: exploring the interface of language and knowledge using Legitimation Code Theory and Terminology Theory

The study has been described to me in a language that I understand and I freely and voluntarily agree to participate. My questions about the study have been answered. I understand that my identity will not be disclosed and that I may withdraw from the study without giving a reason at any time and this will not negatively affect me in any way. I also understand that I have the right to refuse for parts or all the data to be used in the research project.

Participant's name *Moses Daniel*
Participant's signature *M*

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A place of quality, a place to grow, from hope to action through knowledge

FACULTY OF ARTS

Linguistics Department

University of the Western Cape
Robert Sobukwe Road
Private Bag X17, Bellville, 7535
South Africa
Tel: +27 (021) 959-2978/2380
Supervisor: Professor B.E Antia
Email: bantia@uwc.ac.za,
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Participant's name *Fred Mamuno*

Participant's signature *[Signature]*

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Participant's name *Hussaini Modibo*

Participant's signature *modibo*



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Participant's name *Cliff Jacobu*

Participant's signature *Cliff*



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