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Managing science teachers' adoption of the 2005 Tanzanian Inquiry and Student-Centred Curriculum: Revealing schoolbased leaders' practices and achievements

Noel Mark Makwinya
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**Managing science teachers' adoption of the 2005 Tanzanian
Inquiry and Student-Centred Curriculum: Revealing school-
based leaders' practices and achievements**

This thesis is presented for the degree of

Doctor of Philosophy

Noel Mark Makwinya

Edith Cowan University

School of Education

2020

Abstract

Many countries have made considerable changes to their education systems in response to the forces of globalisation. Tanzania is no exception. The most recent educational change attempt in Tanzania relates to the introduction of the 2005 Tanzanian Inquiry and Student-Centred Curriculum.

Sound change-leadership is a necessary condition for the realisation of change, particularly in influencing its adoption. Within the descriptive qualitative research paradigm, this study employed a Type IV (embedded and multiple) case-study design to examine and describe science teachers' lived experiences in dealing with this latest Tanzanian curriculum and the role played by school-based leaders in influencing such experiences. The study was carried out in three case-study schools. Data regarding change leadership were collected from both teachers and school leaders by means of personal interviews, observations, and document reviews. Data regarding science teachers' levels of adoption of this curriculum and related concerns, all of which helped to gauge the effectiveness of change-adoption leadership provided by School-Based Leaders, were collected using semi-structured interviews and a Stage of Concern Questionnaire and were triangulated through document reviews and in-class observations.

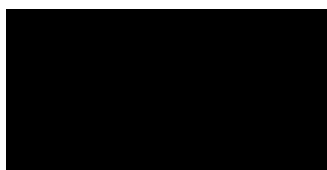
The findings show that school-based leaders in all case-study schools guided adoption of change primarily using authoritarian strategies. Nevertheless, there was some evidence to suggest that school-based leaders in the high performing and the medium performing case-study schools tended to employ additional strategies that inclined towards collective and empowering leadership approaches. This difference appeared to covary with the science teachers' levels of use of this curriculum and their concerns about it in the three case-study schools. Adoption challenges and those affecting leadership of change are also detailed.

These findings extend the ongoing academic discussion about the leadership of adoption of educational changes in schools. The understanding of pedagogical change gained through this study has implications for both policy and practice, and these are discussed in the last chapter. Leaders of these and other schools in equivalent contexts may use findings of this study to reflect upon their change-leadership practices in schools and improve the way they enhance pedagogical transformations and the professional development of their teachers.

Declaration

I certify that the intellectual content of this doctoral thesis is the product of my work. To the best of my knowledge, this thesis contains no materials that were previously published or accepted for a degree, diploma, or certificate by any university or institution. The use of intellectual materials of other academics and authors in this thesis has considered copyright laws, as all of them were strictly acknowledged.

Signed and dated:



November 2019

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I am very grateful to Edith Cowan University (ECU) for the scholarship to undertake this doctoral study. This support is a remarkable contribution to my personal academic growth and the development of the teaching profession in Tanzania.

Had it not been because of the support of my supervisors, this thesis would not have come to fruition and appearing in this form. First, I extend my heartfelt gratitude to Associate Professor Geoff Lummis, my principal supervisor. He was remarkably instrumental in getting this ‘ball’ rolling, particularly considering that he joined the supervision team when this ball lacked the ‘coaching’ of his calibre. He was constantly accessible for support and very timely in providing advice and comments, which helped me to finish this thesis on time. Second, I extend such special appreciations to Professor David McKinnon, my associate supervisor, mentor, and my father. He mentored me in this work from start to finish. In this thesis, there is no single word or argument that lacked his sight and input. I will not forget the way he treated me like his own child from the first day I arrived in Perth to the day I completed this thesis. The opportunity that he and his wife, Olga, granted me to live under their roof in Bathurst at their own expenses for six weeks from February 2019, working tightly with me to ensure that I finally score this goal, is unforgettable. His support made a big difference. Putting in a summary, Associate Professor Geoff Lummis and Professor David McKinnon are simply the best research supervisors by which every Ph.D. candidate would wish to be supervised.

I am also indebted to, and thank and acknowledge, the following: first, the participants of this study for their candidness and persistence, which contributed immeasurably to this study; second, to my employer, the Sokoine University of Agriculture for granting me a study leave; and, third, my colleagues at the Department of Education for their support when I first flew to Australia to start this race.

I also extend my abundant blessings to my parents, Hilda and Mark, for sending me to the best schools and for their sacrifice to finance my previous education. I thank them also for inspiring me to engage in this teaching profession. I am a teacher today largely because I liked their job. They taught me never to ‘give up’, and this has been my motto.

My children, Jacqueline and Hillary, and their Mother deserve special remark and appreciation. Despite staying away from them for 4 years in Australia, they lived serenely in Tanzania to permit me to accomplish this mission. I feel indebted to recognise Jaqueline, my first daughter, in a special way. She could not live with me for approximately seven years during her childhood for this is a period when I had to fly overseas to study both my Master and PhD. Notwithstanding that she missed my presence, Jaqueline never stopped sending colourful messages of profound love, heartening me to stay composed and focused on what kept me far from my family. For this reason, I dedicate this doctoral thesis to Jaqueline.

Many other people contributed to this achievement, but it is not easy to mention each of them. I thank you ALL.

Preface

The origin of my interest in investigating the linkage between professional learning and educational change dates to the late 1990s, when Tanzania reformed its curriculum from being subject-based to a broad-field design. I observed the presence of adoption concerns in my parents, who were primary school teachers, as they attempted to deal with this change. Most evenings during that time when they reflected and discussed concerning their work, I heard my mother complaining that she had to deal with that change in the midst of feeling an increasing lack of support, and this left her desperate, wondering how successfully she could have dealt with it in such contexts.

In 2005, Tanzania introduced the Inquiry and Student-Centred Curriculum. Immediately following this change, the students' academic performance declined considerably. This issue reminded me of my parents' situation. I strongly believed that teachers who had to deal with this curriculum, particularly science teachers, were experiencing concerns similar to those expressed by my parents.

Ten years after the 2005 Tanzanian curriculum reform, I had the necessary gears to study 'these issues', albeit by involving other teachers. I had already studied a four-year university science-teacher education course at the University of Dar es Salaam, Tanzania, and later a Master of Science Education in instructional design at the University of Groningen in The Netherlands. Considering these credentials, I was employed as a curriculum development educator and mid-career academician, previously at the Songea Teachers' Training College and later in the Department of Education at the Sokoine University of Agriculture. Both of these institutions are in Tanzania.

Therefore, this doctoral study came just in time. Any reader of this research is expected to benefit from the theoretical and practical implications for guiding change. Most importantly, this study has opened another journey for me to engage in further research about change and is a foundation to increase my involvement in professional development activities focusing on Tanzanian education. I look forward eagerly to carrying out these challenging but vital tasks.

TABLE OF CONTENTS

ABSTRACT	i
DECLARATION.....	ii
ACKNOWLEDGEMENT	iii
PREFACE.....	v
LIST OF TABLES	x
LIST OF FIGURES	xi
LIST OF ABBREVIATIONS.....	xii
GLOSSARY	xiii
NOTES ON STYLE	xv
CHAPTER ONE: INTRODUCTION	1
1.1 THE NEED FOR EDUCATIONAL CHANGE	1
1.2 LEARNING ABOUT CHANGE AND CHANGE LEADERSHIP	3
1.3 THIS STUDY IN BRIEF	4
1.3.1 <i>The importance of this study</i>	5
1.3.2 <i>Delimiting this study</i>	6
1.4 THESIS OUTLINE.....	7
CHAPTER TWO: THE STUDY CONTEXT	9
2.1. TANZANIA IN BRIEF	9
2.2. THE TANZANIAN FORMAL EDUCATION SYSTEM	10
2.3. THE MANAGEMENT OF EDUCATION	12
2.4. THE SNAPSHOT OF CURRICULUM CHANGES IN TANZANIA.....	14
2.4.1. <i>Indigenous education and reforms made under the British rule</i>	14
2.4.2. <i>Education reform in Tanzania from 1961 to the late 1990s</i>	15
2.4.3. <i>The 2005 Tanzanian ISCS Curriculum reform</i>	20
2.4.3.1. <i>Key aspects of the 2005 Tanzanian ISCS Curriculum</i>	22
2.5. LEADERSHIP OF SCHOOLS.....	23
2.6. THE POSITION OF SBL IN TRANSFORMING SCHOOLS	25
2.7. CHAPTER SUMMARY	26
CHAPTER THREE: LITERATURE REVIEW.....	27
3.1. INTRODUCTION	27
3.2. THE REFORM AGENDA	27
3.3. THE PROCESS OF CHANGE.....	29
3.4. IMPORTANCE OF GUIDING CHANGE ADOPTION	32
3.5. GUIDING ADOPTION OF CHANGE IN SCHOOLS.....	33
3.5.1. <i>Defining school-based leaders (SBLs)</i>	34
3.5.2. <i>Approaches to change leadership</i>	36
3.5.2.1. <i>Managerial leadership of change</i>	38
3.5.2.2. <i>Instructional leadership of change</i>	40
3.5.2.3. <i>Transformational leadership of change</i>	41
3.5.2.4. <i>The best way to lead educational change in schools</i>	45

3.5.3.	<i>Change leadership determinants</i>	47
3.5.3.1.	<i>Change leadership capacity</i>	48
3.5.3.2.	<i>School context and climate</i>	49
3.5.3.3.	<i>External context</i>	50
3.5.4.	<i>Summary</i>	51
3.6.	MODELS FOR EVALUATING ADOPTION AND MANAGEMENT OF CHANGE	51
3.6.1.	<i>The Concerns-Based Adoption Model</i>	52
3.6.1.1.	<i>The Stages of Concerns (SoC)</i>	53
3.6.1.2.	<i>Levels of Use (LoU)</i>	54
3.6.1.3.	<i>Innovation Configuration (IC)</i>	54
3.6.1.4.	<i>Advantages of the CBAM</i>	55
3.7.	SUMMARY OF THE LITERATURE REVIEW	56
3.8.	CONCLUSION.....	58
	CHAPTER FOUR: METHODOLOGY	59
4.1.	INTRODUCTION	59
4.2.	RESEARCH APPROACH	59
4.3.	RESEARCH DESIGN.....	61
4.4.	SELECTION OF CASES	62
4.5.	KEY PARTICIPANTS	65
4.6.	DATA COLLECTION INSTRUMENTS AND TECHNIQUES.....	68
4.6.1.	<i>Interviews</i>	68
4.6.1.1.	<i>Intended data</i>	69
4.6.1.2.	<i>Interview language</i>	70
4.6.2.	<i>Document Reviews</i>	70
4.6.3.	<i>Observation</i>	71
4.6.4.	<i>Questionnaire</i>	73
4.7.	DATA COLLECTION PROCEDURES	76
4.7.1.	<i>Entering the field</i>	76
4.7.2.	<i>Building rapport</i>	76
4.7.3.	<i>Data collection sequence</i>	77
4.8.	DATA ANALYSIS.....	79
4.8.1.	<i>Organisation and management of the dataset</i>	79
4.8.2.	<i>Analysis of qualitative data</i>	79
4.8.2.1.	<i>Transcription of interviews</i>	79
4.8.2.2.	<i>Translation of interviews</i>	80
4.8.2.3.	<i>Familiarisation with data</i>	80
4.8.2.4.	<i>Data coding</i>	81
4.8.2.5.	<i>Categorisation and Theming</i>	84
4.8.3.	<i>Analysis of SoCQ data</i>	85
4.9.	QUALITY CONTROL.....	86
4.9.1.	<i>During the data collection process</i>	86
4.9.2.	<i>During the data analysis process</i>	87
4.10.	ETHICAL CONSIDERATION	87
4.11.	CHAPTER SUMMARY	88
	CHAPTER FIVE: THE STUDY FINDINGS.....	89
5.1.	INTRODUCTION	89
5.2.	CASE-STUDY SCHOOL 1: THE LOWER PERFORMING SCHOOL (LPS)....	90
5.2.1.	<i>Background information of the LPS</i>	90

	5.2.1.1.	Population and infrastructures.....	90
	5.2.1.2.	Study participants.....	92
	5.2.2.	<i>Leadership of adoption and implementation.....</i>	93
	5.2.2.1.	Monitoring the implementation.....	94
	5.2.2.2.	Guiding the implementation.....	96
	5.2.2.3.	Unexpected themes	100
	5.2.3.	<i>Teachers' implementation of the curriculum</i>	102
	5.2.3.1.	Instructional Planning	102
	5.2.3.2.	Presentation location, materials and facilities.....	102
	5.2.3.3.	The teaching process and strategies	103
	5.2.3.4.	Summary	107
	5.2.4.	<i>Teachers' concerns about the curriculum.....</i>	110
	5.2.4.1.	Teacher Chesco's Stage of concerns (SoC)	110
	5.2.4.2.	Teacher Chaula Stage of concerns (SoC).....	111
	5.2.4.3.	Teacher Chacha's Stage of concerns (SoC).....	112
	5.2.4.4.	Teacher Chiku Stage of concerns (SoC)	113
	5.2.4.5.	The Lower Performing case-study school (LPS) SoC Profile	114
	5.2.5.	<i>Overall summary for the LPS.....</i>	116
5.3.		CASE-STUDY SCHOOL 2: THE MEDIUM PERFORMING SCHOOL ...	116
	5.3.1.	<i>Context and background of the MPS</i>	116
	5.3.1.1.	Population and infrastructures.....	117
	5.3.1.2.	Description of study participants	119
	5.3.2.	<i>SBLs' leadership of curriculum-adoption and implementation.....</i>	121
	5.3.2.1.	Monitoring classroom teaching.....	121
	5.3.2.2.	Management of Adoption and implementation.....	127
	5.3.2.3.	Unexpected theme.....	137
	5.3.3.	<i>Teachers' implementation of curriculum</i>	138
	5.3.3.1.	Instructional planning	139
	5.3.3.2.	Presentation materials and environment	139
	5.3.3.3.	Instructional strategies and processes	140
	5.3.3.4.	Summary	144
	5.3.4.	<i>Teachers' Stages of Concerns.....</i>	147
	5.3.4.1.	Teacher Batuli's Stage of Concerns (SoC)	147
	5.3.4.2.	Teacher Beatrice's Stages of Concerns (SoC)	148
	5.3.4.3.	Teacher Bertha's Stages of Concern (SoC)	149
	5.3.4.4.	Teacher Birgitta's Stages of Concern (SoC).....	151
	5.3.4.5.	The Medium Performing School (MPS) SoC concern profile	152
	5.3.5.	<i>Overall summary for the MPS</i>	153
5.4.		CASE-STUDY SCHOOL 3: THE HIGHER PERFORMING SCHOOL	153
	5.4.1.	<i>Context description</i>	154
	5.4.1.1.	Population and staff organisation.....	154
	5.4.1.2.	Description of participants	155
	5.4.2.	<i>SBLs' leadership of curriculum adoption</i>	157
	5.4.2.1.	Monitoring classroom teaching.....	157
	5.4.2.2.	Curriculum adoption guidance	163
	5.4.3.	<i>Teachers' level of adoption.....</i>	175
	5.4.3.1.	Implementation of the curriculum.....	175
	5.4.3.2.	Teachers' concerns about the curriculum	185
	5.4.4.	<i>Overall summary for the HPS.....</i>	193
5.5.		THE CROSS-CASE FINDINGS.....	193
	5.5.1.	<i>School backgrounds and contexts.....</i>	194
	5.5.2.	<i>Curriculum-adoption leadership strategies</i>	195

5.5.2.1.	Administrative leadership practices	195
5.5.2.2.	Promoting change through empowerment	197
5.5.2.3.	Promoting adoption through collegiality	198
5.5.3.	<i>Intervening factors</i>	199
5.5.3.1.	Curriculum leadership capacity.....	199
5.5.3.2.	Interaction culture	200
5.5.4.	<i>Teachers' level of curriculum adoption</i>	200
5.5.4.1.	The SoC.....	201
5.5.4.2.	Configuration of implementation.....	202
5.6.	CHAPTER SUMMARY	205
CHAPTER SIX: DISCUSSION.....		206
6.1.	INTRODUCTION	206
6.2.	THE SBLs' STRATEGIES OF PROMOTING ADOPTION.....	206
6.2.1.	<i>Managerial leadership practice</i>	206
6.2.1.1.	Summary	211
6.2.2.	<i>Empowering by involvement</i>	212
6.2.2.1.	Involvement approaches	213
6.2.2.2.	Perceived advantages	216
6.2.2.3.	Summary	218
6.2.3.	<i>Collegiality as a change-adoption fostering strategy</i>	220
6.2.3.1.	Tactics used to build collegiality within schools	221
6.2.3.2.	The overall nature of collegiality in case-study schools	224
6.2.3.3.	Summary	225
6.3.	CHALLENGES AND BARRIERS	226
6.3.1.	<i>SBLs' capacity to lead the curriculum-adoption</i>	227
6.3.2.	<i>Teachers' norms of privacy</i>	228
6.3.3.	<i>Instructional barriers</i>	232
6.3.4.	<i>Summary</i>	233
6.4.	TEACHERS' LEVELS OF IMPLEMENTATION AND MAIN CONCERNS..	233
6.4.1.	<i>Teachers' main concerns</i>	234
6.4.1.1.	Concerns about Information.....	234
6.4.1.2.	Management Concerns.....	235
6.4.1.3.	Collaboration desires.....	235
6.4.2.	<i>Configuration of Implementation of Curriculum Components</i>	236
6.5.	CHAPTER SUMMARY	239
CHAPTER SEVEN: CONCLUSION AND RECOMMENDATIONS.....		240
7.1.	OVERVIEW OF STUDY.....	240
7.2.	IMPLICATIONS FOR POLICY AND PRACTICE	241
7.2.1.	<i>Implications for curriculum developers in Tanzania</i>	241
7.2.2.	<i>Implications for School-Based Leaders</i>	243
7.3.	THE STUDY LIMITATIONS AND RECOMMENDATIONS	243
7.3.1.	<i>Generalisability issue</i>	244
7.3.2.	<i>Mortality issue</i>	244
7.3.3.	<i>Instrumentation issue</i>	245
7.4.	OPPORTUNITIES FOR FUTURE RESEARCH	247
7.5.	THESIS CLOSURE.....	248

List of Tables

Table 1 - Qualifiers Used to Categorise Schools	63
Table 2 - Data Collection Instrument and Strategies	75
Table 3 - Data Collection Sequence	78
Table 4 - Coding Types Used for Different Data Sources.....	83
Table 5 - Stages of Concern and Typical Items.....	85
Table 6 - Participants and their Pseudonyms.....	92
Table 7 - The Summary of the backwardly Mapped Configuration of Implementation of Curriculum components for the LPS	109
Table 8 - Participants and Their Pseudonyms	119
Table 9 - Summary of the Backwardly Mapped Configuration of Implementation of Curriculum components for the MPS	146
Table 10 - The Backwardly Mapped Configuration of Implementation of Curriculum components for the HPS	183

List of Figures

Figure 1. The Tanzanian formal education system.....	11
Figure 2. The 2-level interactive system framework.	57
Figure 3. A typical classroom in the LPS.	91
Figure 4. The SoC of teacher Chesco.	110
Figure 5. The SoC of teacher Chaula.....	111
Figure 6. The SoC of teacher Chacha.	113
Figure 7. The SoC of teacher Chiku.	114
Figure 8. The LPS SoC profile.	115
Figure 9. Students conducting a chemistry practical.	118
Figure 10. Concern profile of Teacher Batuli.....	147
Figure 11. The SoC profile of Teacher Beatrice.....	149
Figure 12. The SoC profile of Teacher Bertha.	150
Figure 13. The SoC profile of teacher Birgitta.	151
Figure 14. The MPS SoC profile.	153
Figure 15. Students attending a laboratory practical session in the HPS.	155
Figure 16. Concern profile of Teacher Amina.....	186
Figure 17. Concern profile of Teacher Alice.....	187
Figure 18. Concern profile of Teacher Andrew.....	189
Figure 19. Concern profile of Teacher Asha.	190
Figure 20. The Higher Performing Case-study School's SoC Profile.....	191

List of Abbreviations

BEST:	Basic Education Statistics. This is a database that provides Pre-Primary, Primary, and Secondary level Education information. Statistics on this database includes school and regional academic performance levels; teachers-to-pupil ratios; infrastructures; school enrolment rates, and completion rates.
CBAM:	Concerns-Based Adoption Model. This model provides ways to assess change-users' concerns, their adaptation, and their levels of use of change.
GAM:	General Academic Master/Mistress. These are assistants of school principals, helping to superintend overall progress of academic matters within schools.
IMF	The International Monetary Fund.
NECTA:	National Examination Council of Tanzania. This is the department responsible for summative examination of primary and secondary school students. Information about performance of every student can be accessed from this department
MoEVT:	Ministry of Education and Vocational Training of Tanzania.
PMORLG:	Prime Minister's Office Regional Administration and Local Government. This is a department of the Tanzanian prime minister's office and is responsible for monitoring regional and local governance, part of which deals with education
SBLs:	School-based leaders
TIE:	The Tanzanian Institute of Education. This department is under the MoEVT and is responsible for curriculum development.

Glossary

Change:	Change is a process of transformation, a transition from one educational system and process to another, resulting in a realignment of existing values and outcomes.
College teacher-education:	Change is a process of transformation, a transition from one educational system and process to another, resulting in a realignment of existing values and outcomes.
College teacher-education:	This is a 2-year teacher education training. 50% of this training is on content and the remaining 50% is on pedagogy.
Innovation Configuration:	The word picture description of the program components that is provided by program a developer, showing ways in which implementation should look like in practice. While accepting variations, it describes behaviours that are ideal, acceptable, and unacceptable.
Backwardly mapped Innovation Configuration of implementation:	This is world picture description of how actually the teachers dealt with the program components, developed by researcher after observing, interviewing, and reviewing their program documents.
Inquiry and Student-Centred pedagogy:	As an umbrella phrase, this phrase integrates various forms of instructions and learning. With respect to the 2005 Tanzanian curriculum, examples of practices that hallmark this approach include experimentation, field-based, projects, cooperative learning, problem-solving, and higher order questioning.
Professional Learning:	To implement change, teachers require to learn new about it, advance their knowledge, beliefs, and attitudes about it, and to

sustain that change over time. In this study, this process is what is referred to as professional learning.

School-Based Leaders:	This term refers to the leadership team composed of three members within a school: The School Principal, Head of Departments, and General Academic Master/Mistress.
Science subject	The Tanzanian primary and secondary education curriculum is compartmentalised, meaning that every subject having its own syllabus. For the lower level secondary education Tanzanian curriculum, science subjects mainly include Physics, Biology, Chemistry, Geography, and Mathematics.
Support or Expert-teachers:	These are teachers who are pedagogically excellent because of having substantial experience in teaching and/or because of intensive in-service training they attended regarding the 2005 Tanzanian ISCS Curriculum. In the investigated schools, they played as role models, mentors, and facilitator of professional learning needs of others.
Syllabus:	This refers to a formal and structured subject domain learning activities extracted from the main curriculum and used as a guide in the selection and organisation of teaching and learning activities.
University teacher-education:	In the Tanzanian context, this is a 3-years teacher education program. 60 to 70% of this training focuses on content and about 30 to 40% is pedagogy.

Notes on Style

In Chapter 5, italicised texts denote vignettes selected from participants' own statements shared during the interviews. For longer excerpts, Kiswahili verbatim transcriptions are presented first and then followed by the English translations. Such translations are in boxes placed next to their related Kiswahili verbatim transcripts. Styling the vignettes in this way is aimed at emphasising and preserving the authentic first-language voice and associated cultural inferences of the participants themselves.

Chapter One: Introduction

One of the most significant problems that we face [at times of major changes] is that ... as teachers ..., we have felt a growing lack of [support or] empowerment, that has left us at times despairing, wondering what we can do, where to begin, [or] how to make the changes that are so necessary. (Gerver, 2010, p. xv)

This thesis presents findings of the study regarding change-adoption leadership approaches and practices employed by secondary School-Based Leaders (SBLs) in Tanzania and their contribution to science teachers' perceptions about, and adoption of, change involving secondary education curriculum introduced in 2005. Findings of this study provide useful insights into change-leadership approaches that may be scaled up to enhance the rapid realisation of this new Tanzanian curriculum.

This chapter introduces the study and provides its rationale. It starts by explaining why Tanzania and other countries in the world have reformed (and are continuing to reform) their education systems, particularly their curriculum designs. Then, it briefly describes the goals, questions, and the significance of this study. This chapter concludes with an outline of this thesis, which provides a very brief introduction to the issues covered in each of the next chapters.

1.1 The need for educational change

All of us acknowledge that the education system we attended was designed for a very different world from the one in which our children are living today. Gerver (2010) argues that if one lists things that exist today but did not exist thirty years ago, then the list would be very lengthy. We can also imagine how extensive a list could be if one extends it to cover the last century (Gerver, 2010). Alexander and Potter (2005) are of the opinion that children who will be born 30 years from today may fail to imagine the world in which their grandparents and we, their parents, lived. Essentially, when we compare two consecutive centuries or decades, we realise that substantial change is always extant, showing us that the future will belong to a very different person.

Currently, schools are operating in a dynamic environment, fuelled by the advancement of technology, social, and other global demands. Gerver (2010) and Jacobs (2010), therefore, are of the view that this context demands our school system to cultivate different sets of qualities and skills in our children. They argue that the current world favours children with conceptual qualities that make them inventive and capable of responding quickly and dynamically to changing situations (Gerver, 2010; Jacobs, 2010). Given these contextual changes, Alexander and Potter (2005) comment that a learner can no longer be viewed as a mere customer of knowledge, but rather, a developer of it. The 19th century school system, which was mainly characterised by inflexible classrooms and more emphasis on compliance and conformity in instructional processes, according to Alexander and Potter (2005), is less relevant for the 21st Century. A new schooling system is required to prepare children to become dynamic and responsive to this rapidly changing world (Alexander & Potter, 2005). Jacobs (2010), in emphasising a need for educational transformation, notes that:

There is a need to overhaul, update, and inject life into our curriculum and dramatically alter the format of what our schools look like to match with the time in which we live, [and] to prepare the learners for their world and their future. (Jacobs, 2010, p. 2)

Given that we have no idea what characteristics of individuals will be required in the next one hundred years, contemporary education policies around the world are placing more emphasis on changing classroom practices (Alexander & Potter, 2005; Gerver, 2010; Jacobs, 2010). According to Jacobs (2010), this is why if we examine packages of recent educational policies from different countries, we realise that most of them imply similar thoughts concerning what could make today's schooling systems more effective, what is meant by valuable knowledge, and what teaching and learning ought to be like in the present era. The most recent education policies, according to Jacobs (2010), are designed to ensure that schooling systems prepare children to face future challenges by making them knowledge workers.

As for the rest of the world, the education system of Tanzania has gone through several reforms since its independence in 1961. Each reform attempted substantially changed the Tanzanians' perceptions regarding education and its purpose. That is to say, for the

Tanzanian education system, themes about school change and educational improvement are on the record. Chapter Two presents a summary of the landscape of these reforms. For developing a rationale for this research, the present chapter provides a brief snapshot of the latest reform, and this reform relates to the previous discussion.

In Tanzania, the latest reform movement started in the early 2000s and resulted in the 2005 Tanzanian Inquiry and Student-Centred Curriculum (MoEVT, 2007). This reform arose out of dissatisfactions with the structure of the previous curriculum, which influenced teachers to employ traditional content-mastery or teacher-centred pedagogy, an approach that is blamed for having ended-up producing graduates who lacked sound thinking and life-long learning skills (Mkimbili, 2018; Mtitu, 2014). Therefore, this new curriculum aimed at creating a ‘learning-to-learn’ schooling system to enhance the development of students’ inquiry and critical thinking abilities and to teach them to develop and apply knowledge (MoEVT, 2007, 2010). For achieving its intention of developing future-oriented and meta-cognitive children (MoEVT, 2007), this curriculum emphasises the use of constructivist practices, and in particular, inquiry and learner-centred pedagogical approaches, rather than transmissive ones, (Mkimbili, 2018; MoEVT, 2007, 2010; Mtitu, 2014). There is no doubt that this change presented major anxieties for both teachers and school leaders.

1.2 Learning about change and change leadership

Hall and Hord (2015) point out that “if faculty members are to use new curricula programs or instructional practices, they must learn how to do it” (p.33) for this is the foundation of, and corollary to, change. Hall and Hord (2015) and Fullan (2014) call for personal and professional development as learning about change prepares the change users to deal with it successfully. Fullan (2014) maintains that without meaningful professional development, teachers slide back to their previous curriculum and pedagogical practices, abandoning any suggested change to their current *modus operandi*. Professional learning opportunities help to solve teachers’ problems of feeling the lack of transition-support, which according to Gerver (2010), leaves teachers wondering, not knowing what and how to do and where to begin to make the required changes.

Considering its importance, most theorists (e.g., Hall & Hord; Hargreaves & Fullan, 2012) argue for professional learning to be ongoing rather than only at the beginning of a change

attempt. Hargreaves and Fullan (2012) are of the view that providing continuous assistance permits adopters to develop expertise as they continue to attempt to deal with change. Hall and Hord (2015) support this argument, stating that “task concerns do not become intense until after use [of change] begins” (p. 33). Coupled with the other reasons described deeply in chapter 3, some theorists (e.g., Fullan, 2014; Hall & Hord, 2015; Hargreaves & Fullan, 2012) and researchers (e.g., Hallinger, 2005; Lochmiller, 2016) call for the change leadership task to be shouldered by SBLs as these are best positioned to meet this requirement in a less costly way. It is for this reason SBLs are said to be the second most important leading factor after ‘the context’ in influencing the adoption of reforms (Fullan, 2001). Fullan (2014) and Hallinger (2011), for example, maintain that they have never seen a situation in which SBLs and, in particular, school principals, were not a significant factor in school improvement.

While change academics acknowledge that SBLs are best positioned to lead change, they also understand that this task is very challenging for them. The way SBLs respond to this obligation, and ultimately their effectiveness, is influenced by their awareness of change (Fullan, 2001), their personal experience and leadership capacities (Goldring, Huff, May, & Camburn, 2008), and, most importantly, by the environments and the variety of contexts in which they work and/or have worked (Lummis, Morris, & Lock, 2016). Hallinger and Huber (2012) argue that it is what SBLs do to guide transformation in schools, how, where, and when they undertake it that make them different. On these grounds, it is crucial to gain a clear picture of practices and experiences of school leaders in promoting the adoption of change, as this information can be scaled up to enhance the school effectiveness effort.

1.3 This study in brief

SBLs in Tanzanian schools are responsible “to monitor, supervise, and to ensure high-quality teaching and learning” in schools (MoEVT, 2010, p. 50). They are expected to be aware of what happens behind classroom doors and use such information to develop the capacities of colleagues within their schools (MoEVT, 2010, 2013). On these grounds, the new curriculum, the 2005 Tanzanian Inquiry and Student-Centred Curriculum, presents challenges to SBLs to ensure that they support their fellow teachers to enact it effectively. It is worth informing that while the conception of this curriculum was carried out by the

central government (Kopweh, 2014), teachers and even SBLs themselves were required to deal with it without necessarily having attended any intensive training about it (Kopweh, 2014). Chapter 2 provides much more elaboration on this issue. Given this circumstance, one can imagine the level of anxiety that this transition has created for SBLs and teachers. This study is intended to uncover this issue.

This study intends to illuminate and describe the ways (actions and events) by which SBLs guide science teachers' adoption of the 2005 Tanzanian Inquiry and Student-Centred Curriculum. To examine the effectiveness of leadership of adoption of this curriculum, the science teachers' perceptions about it and their personal configuration of implementation were also examined. Collecting these two broad categories of information was aimed at enriching the discussion concerning the link between pedagogical leadership and school effectiveness in the context of this and similar curriculum changes.

In order to address systematically these objectives, this study was guided by the following three research questions:

- (i). How are School-Based Leaders (SBLs) guiding the science teachers' adoption and implementation of the 2005 Tanzanian ISCS Curriculum?
- (ii). How are science teachers dealing with the 2005 Tanzanian ISCS Curriculum and what are their main concerns about it?
- (iii). In what ways does the change facilitation provided in different secondary schools account for the ways in which, and variation in the way, if any, the 2005 Tanzanian ISCS Curriculum is perceived and implemented by science teachers in Tanzanian secondary schools?

1.3.1 The importance of this study

Schools are being challenged to question the basic premise of what it looks like to lead effectively the implementation of educational changes. Better understanding of features of schools that are considered successful, and the characteristics and behaviours of their leaders contributes to the knowledge and improvement of an education system in a specific country and even in other similar countries around the world. As stated previously in this

chapter, there is limited research dealing with the leadership of adoption of the national curriculum within the Tanzanian context. This study addresses this gap. Hence, it will help to inform the Tanzanian Ministry of Education regarding the degree of adoption of the 14-year old 2005 Tanzanian Inquiry and Student-Centred Curriculum, its variation amongst three selected schools, and how these are accounted for by school leadership practices and approaches. In this way, the findings may help persuade the Tanzanian government about the necessity of improving change leadership practice and process in secondary schools to enhance the prospects of school leaders of successfully promoting the implementation of this and other education reforms. Therefore, this investigation has implications for both policy and practice focusing on improving the capacities of school-based leaders to provide professional learning for their teachers.

The institutionalisation process of educational change has been investigated broadly in the developed world. As such, theory and previous research from these contexts can tell a great deal about change-processes. However, gaining an understanding of the extent to which a particular social theory “fits and works” (Taylor, Bogdan, & DeVault, 2016, p. 157) in different social contexts is emphasised given the fact that generalisation of the knowledge about a social phenomenon is strengthened when insights and evidence are gained from as many different contexts as possible (Stake, 2006; Taylor et al., 2016; Yin, 2014). This issue underpins the secondary importance of this study. Although this study was conducted in the Tanzanian context, the issues investigated and the findings obtained are not confined to only Tanzanian secondary schools, but also provide data, knowledge, and perspectives that may resonate with other similar contexts. Thus, insights about the institutionalisation of the 2005 Tanzanian ISCS Curriculum provide an opportunity for better international comparisons thereby contributing to the growth of knowledge about the process of change. That is to say, literature and theory concerning the process of change are extended from the developed countries, where this issue has been broadly investigated, to include insights from Tanzania, one of the developing countries from Africa.

1.3.2 Delimiting this study

The 2005 Tanzanian Inquiry and Student-Centred Curriculum has various subject-specific syllabuses for the junior and senior secondary education levels. Therefore, narrowing the

area of the study's focus was essential as investigating this entire curriculum would require a researcher to master all subject disciplines. Considering these facts, the focus of this study was limited to the lower Tanzanian secondary school curriculum concerned with science subjects. The word 'science' is, therefore, inserted in the primary name of this curriculum, resulting in what is henceforth referred to in this thesis as the 2005 Tanzanian Inquiry and Student-Centred Science (ISCS) Curriculum. Another delimitation is related to the type of schools investigated. All investigated schools are public and located in the Morogoro region. Further details about features of the investigated schools is provided in Chapter 4.

1.4 Thesis outline

This thesis is organised into Seven (7) chapters. This first chapter (Chapter 1) has provided the research background. Chapter 2 presents the broader context of this study. In this way, it allows readers of this thesis to gain a better understanding of the context in which this study was conducted. A large part of Chapter 2 depicts the educational reform trend in Tanzania, giving a richer background to the commencement of the 2005 Tanzanian Inquiry and Student-Centred Science (ISCS) Curriculum, the focus of this study. Additional information provided in this chapter includes the Tanzanian formal education system and educational leadership structure, all of which are pertinent for this study.

Chapter 3 is a review of the extant literature. This broadens our understanding of the issue of educational change, the area of interest for this study. Special attention is given to the issue of change adoption and implementation, and the position and role of school-based leaders (SBLs) in this process, as these consolidate the rationale for this study and create the main framework employed in the investigation. Furthermore, the chapter presents the Concern Based Adoption Model (CBAM), a model employed widely in investigations of the adoption of educational change.

Chapter 4 elucidates the research methodology and design. This chapter describes the research approach selected, the data gathering strategies, the procedures employed in analysing the data, the steps and stages followed, and reasons for the decisions undertaken. Ethical considerations and how they were addressed are also highlighted.

Chapter 5 presents the results of this study. It is the longest chapter, as it presents both curriculum adoption leadership practices and teachers' levels of adoption for each case-study school in an integrated fashion. The contextual and demographic features that most likely impacted on the way in which participants dealt with the 2005 Tanzanian ISCS Curriculum are also highlighted.

Chapter 6 summarises the results reported in Chapter 5 and discusses the way these results relate to previous research and theory. Chapter 7 concludes with a critique of the way in which this study was carried out, implications, and suggestions for policy, practice, and for future research.

Chapter Two: The Study Context

This chapter presents the broader educational context in Tanzania, where this study was conducted. It starts with a brief description of Tanzania, which is considered useful for the readers of this thesis to understand the context in which educational reforms adopted from Europe and America are being implemented. The Tanzanian education system and its management system are then explained. The chapter then presents an overview of major educational reforms occurred in Tanzania from its independence in 1961 through to 2005. This is aimed at providing readers of this thesis, particularly non-Tanzanian readers, a snapshot of the path from which the 2005 Tanzanian Inquiry and Student-Centred Science (ISCS) Curriculum evolved and in which it is currently operating. The chapter concludes with a description of the structure of Tanzanian school leadership, and this is aimed at clarifying the strategic positions of school-based leaders (SBLs) in influencing teachers' adoption of educational changes imposed by the Tanzanian government.

2.1. Tanzania in brief

Tanzania, one of the East African countries, has an area of 945,087 square kilometres. Its population, according to the 2012 Tanzanian National Bureau of Statistics, is projected to reach 50 million by 2020. Tanzania has one of the weakest economies in the world in terms of per capita income. Its national income is mainly dependent on rain-fed agriculture, which employs about 65 percent of the entire workforce. In the mid-1980s, Tanzania adopted a liberalisation policy to promote its economy. Even though this policy attracted some domestic and foreign investments, the Tanzanian economy has remained in the early stages of transition from a command driven to a free-market economy. Its Gross Domestic Product (GDP) growth rate has, on average, remained at 6-7% since 2015 (IMF, 2018). As such, development budgets for many years have been facing significant shortages, and this has negatively impacted investments in social service sectors such as education. Research (Mkimbili, 2018; Semali & Mehta, 2012) and the Basic Education Statistics of Tanzania (BEST) of 2017 (PMLARG, 2018) indicate critical shortages of laboratories, laboratory equipment, books, classrooms, and science teachers in both primary and secondary schools. These shortages underscore unfavourable school and

classroom contexts for the ongoing attempts to implement the 2005 Tanzanian ISCS Curriculum.

2.2. The Tanzanian formal education system

The formal education system in Tanzania is chronologically structured and runs from the pre-primary school through to university level. This system is categorised into two main clusters: the academic and non-academic (MoEVT, 2010). The non-academic cluster encompasses Technical Schools; Vocational Education and Training Centres; and, Folk Development Colleges. The non-academic cluster is specifically for providing technical knowledge and skills to out-of-school children or those who did not enrol in post-primary or post-secondary education.

The academic cluster, comprises: (i) the pre- primary and primary, (ii) the junior and senior secondary, and (iii) the tertiary education levels, and follows a 2+7+4+2+3+ education structure (URT, 2014). That is, the schooling starting age for pre-primary education is four years and this level takes two years to complete. Next, a child shifts to primary education at age six and it takes her/him seven years to complete this stage (URT, 2014). Currently, a student completes primary school at the age of 13. The 2014 Tanzanian Education Policy, which is the latest Tanzanian policy of education, requires a child to complete this level at the age of 10 (URT, 2014). Many schools have gradually started to adopt this requirement, but it is not yet the ‘strict’ rule in many schools.

Secondary education is divided into two levels: junior and senior. The junior secondary education level comprises four years while the senior secondary education level takes two years (URT, 2014). The tertiary education level comprises colleges and universities. Primary and junior secondary education is compulsory and free in public schools. Fees for secondary school and other financial contributions that parents had to pay for their children for this education were abolished in 2016, a decision stirred by the 2014 Tanzanian Education policy (URT, 2014) and backed-up with the Circular No. 5 of 2015 and Circular No. 3 of 2016. These costs are currently covered through capitation grants sent to schools by the Tanzanian government (MoEVT, 2018).

There is no national examination to determine children's transition from pre-primary into primary schools. At the end of primary and secondary education, however, every student undertakes a Tanzanian National Examination (MoEVT, 2007). Therefore, transitioning to the next education level is subject to a student's performance in the National Examination at the end of the preceding level. Nevertheless, exit opportunities, as depicted in Figure 1, are available for those whose examination results are not adequate to transit to the next educational level.

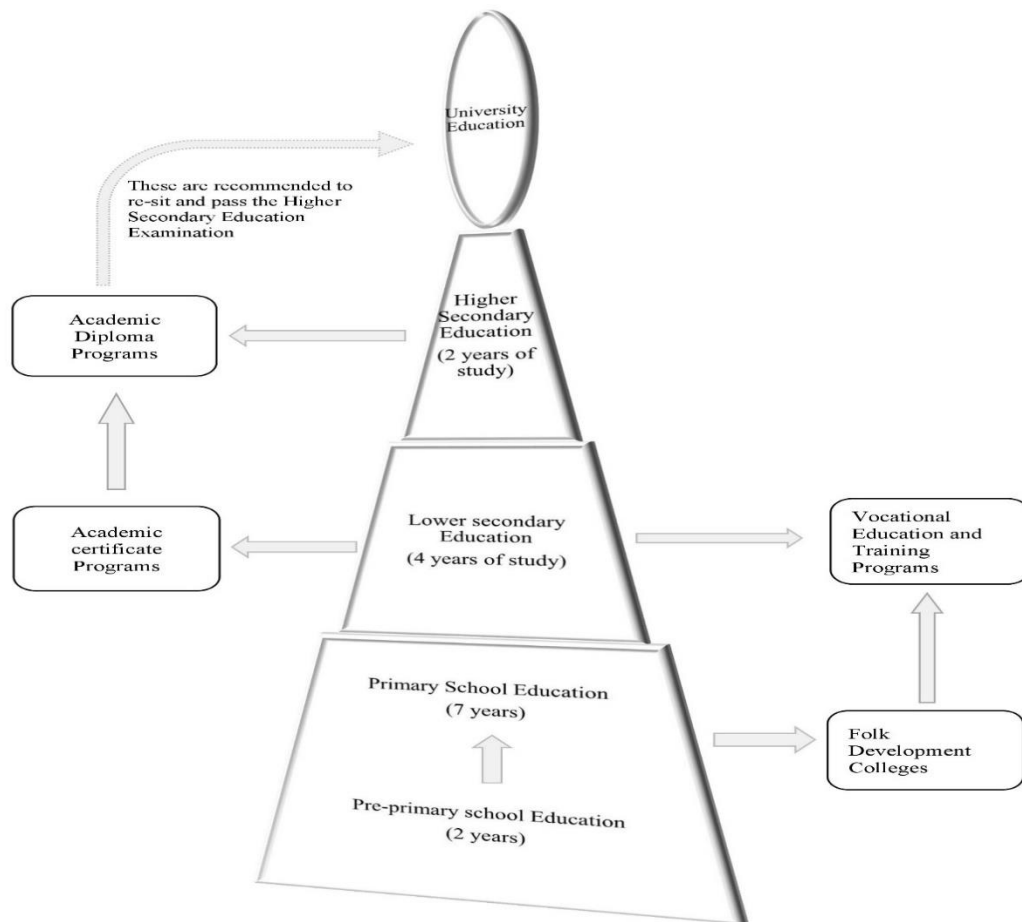


Figure 1. The Tanzanian formal education system.

Primary school leavers may attend Folk Development Colleges (FDCs), where they are provided with practical knowledge and basic skills such as entrepreneurship, carpentry, cookery, housekeeping, masonry, and tailoring (i.e., vocational education and training skills) (Nzima, 2016). Candidates who graduate from the secondary school level may enrol in professional certificate programs and later apply for a course leading to a diploma.

Secondary school graduates may alternatively exit into vocational training centres to attend the skill-offering programs described above. Figure 1 illustrates all pathways for students in the Tanzania's formal education system.

The Tanzanian curriculum is spiral in nature. Therefore, there is an increasing level of complexity as students proceed up the system. In secondary schools, the science domain is split into four main subjects: Physics, Chemistry, Geography and Biology. Junior secondary education students are required to deal with a minimum of seven subjects, five of which (Kiswahili, English, Mathematics, Civics, that is, citizenship, and Biology) are compulsory (MoEVT, 2007). Every student is required to elect another two subjects from Natural Sciences or from the Art and Social Science disciplines. Optional subjects from the natural science discipline are Physics, Chemistry, and Geography. Elective subjects from the Social science discipline include Bookkeeping, Commerce, Home Economics, History, and Aesthetics (MoEVT, 2007).

2.3. The management of Education

Centralisation of education management was the first approach adopted in Tanzania just after its independence in 1961. This approach was purposefully adopted to ensure that a large part of the challenges inherited from the British education system, particularly the high illiteracy level, were solved rapidly by the few experts who were only employed at the ministerial level (Godha, 2014; Matete, 2016).

This complete centralisation of educational management lasted for about 10 years, and its transition to the later forms was stirred by a convergence of local and global factors. From 1972 to the mid-1980s, Tanzania experienced a pressing economic instability. Therefore, a large part of previous educational programs was affected severely (Msabila, 2013; Rwiza, 2016). On these grounds, the centralised educational-management system seemed ineffective and arguments emerged for a decentralised one.

The decentralisation processes were initially realised through 'deconcentration'. Field offices in each district and region were launched as part of this initiative (Godha, 2014; Rwiza, 2016). The institutionalisation of these offices was boosted with the enactment of the Local Government Act in 1984 (Godha, 2014). These efforts marked the beginning of

the realisation of the idea of sharing responsibilities between the central Tanzanian government and other lower administrative levels.

Decentralisation of educational administration was modified and improved further from 1994. During this time, there was an added influence from both the International Monetary Fund and the World Bank (URT, 2010). Coupled with local desires to improve the delivery of educational services in schools, the Local Government Reform Programme (LGRP) was launched and the decentralisation of education management, at this time, re-appeared again under the name of 'Decentralisation by Devolution' in 1997 (URT, 2010).

These changes intended to decongest leadership responsibilities in the Tanzanian Ministry of Education. Indeed, some of the responsibilities were transferred to schools through the Local Government Authority. An improved partnership between the central Tanzanian government and the lower administrative levels in the management of the secondary school education was initiated by this reform and largely aimed at increasing both the level of accountability, particularly to the local school community, and school performance (Rwiza, 2016).

Based on this new decentralised management approach, the task of managing the entire education sector is currently shouldered in a partnership between the Department of the Prime Minister's Office that deals with Regional Administration and Local Governance (PMO-RALG) and the Ministry of Education and Vocational Training (MoEVT) (URT, 2008, 2010). MoEVT manages the tertiary education level, which includes universities and colleges, while PMO-RALG manages the running of pre-primary, primary, and secondary education.

The education leadership system, however, has continued to suffer from the influence of the past centralist practice. The Ministry of Education and Vocation Training (MoEVT) has continued to control 'complex' and 'sensitive' tasks such as the development of policy and the designing of the National Curriculum (URT, 2008). Centralisation can also be observed on the issues of selecting and approving textbooks, training of teachers, and on school inspections (Kopweh, 2014). That is to say, lower administrative levels can only deal with activities such as the deployment of teachers and prioritisation and allocation of material and financial resources within regions. The specific roles assigned for each lower

administrative level are delineated clearly in legal and policy documents and elaborated in educational development programs developed regularly (URT, 2010). Of interest in this study are the School-Based Leaders (SBLs) and their responsibilities in guiding instruction in schools. Typical responsibilities of SBLs and their connection to this study is provided later in Section 2.6. That is to say, the Tanzanian Ministry of Education principally operates as a typical government bureaucracy.

2.4. The snapshot of curriculum changes in Tanzania

Successive regimes in Tanzania have always desired to bring about educational reforms. Therefore, the Tanzanian education system has experienced various curriculum changes since its independence in 1961. Mushi (2009) states that these reforms were dictated by contexts at local and global levels in terms of macro- and micro-economic and political changes. Nzima (2016) adds that these were in response to changes in global perceptions about the function of education. That is to say, factors that influenced educational changes in Tanzania are numerous. This snapshot is divided into three key sections:

- i. Indigenous education and reforms made under the British rule;
- ii. Education reform from independence 1961 to the late 1990s; and,
- iii. The 2005 Tanzanian ISCS reform.

2.4.1. Indigenous education and reforms made under the British rule

Science education in Tanzania can be traced back to before even the 18th century, when education was localised in small tribal groups (Osaki, 2002; Wandela, 2014). Basically, indigenous groups had contextually-bound science, a large part of which was teaching the youngsters about the values, traditions and their cultural heritage (Mushi, 2009). In those times, there was wide sharing of basic sciences such as craftsmanship, the use of herbs to treat diseases, and the way to link their lived knowledge and experience of the environment with farming practices (Mushi, 2009).

Though indigenous science was less advanced than today, tribesmen shared knowledge and taught each new generation using approaches primarily based on experiential and reflective

practices (Semali & Mehta, 2012). Both teaching and learning processes were carried out practically (i.e., field-based and skill-mastery oriented) and didactically using legends, proverbs, and tales (Semali & Mehta, 2012). The young learned by watching, participating, and, most importantly, by executing what they learned from adults (Mushi, 2009). Given the fact that indigenous education was geared towards solving community problems, the teaching and learning processes were part of living (Wandela, 2014). Therefore, a holistic approach to instruction was the principal characteristic of indigenous education.

One of the critiques of this indigenous education could be that it was not documented in any formal way and there was no national curriculum. Consequently, knowledge was idiosyncratic, confined, and firmly sheltered in the environment and cultural norms that bounded a particular tribe (Mushi, 2009; Semali & Mehta, 2012). In certain instances, “certain skills and knowledge, which traditional education writers call specialised skills or closed curriculum, remained the property of individuals” (Mushi, 2009, p. 40). Given that sharing of knowledge was based on relationships, particularly through inheritance from the family elders (Mushi, 2009), the rate at which knowledge was transferred and shared both across and within tribes was likely very limited. Mushi (2009) presents another remarkable criticism, adding that even though ability to reason was given weight, intellectual growth occupied a very small place in traditional education as more emphasis was on the concrete rather than on the abstract.

It was the coming of the European and Arabic colonialists that sparked the formalisation of education and introduced more modern ways of learning. Since indigenous education and, in particular, science education, was anecdotal and non-quantitative, colonialists perceived it as useless and unscientific in the context of modern schooling (Semali & Mehta, 2012). However, this does not mean to say that colonialists were unaware of the fact that the local context is very important in the construction of science. Rather, they placed less emphasis on the culturally responsive knowledge practices because it was not their intent to develop these (Semali & Mehta, 2012).

2.4.2. Education reform in Tanzanian from 1961 to the late 1990s

The purpose of this Section is to present a succinct overview of the education system that was inherited from the British, and to provide an insight and backdrop to the subsequent

measures taken by the post-colonial governments to transform the Tanzanian education. The overview covers the period from independence in 1961 until 2005 when the existing Tanzanian Inquiry and Student-Centred curriculum emerged. This overview is divided into two phases: from independence in 1961 to the late 1990s, and from the late 1990s to the date of this study (2017-2019).

Tanzania obtained its independence from the British in 1961. Therefore, Tanzanian post-colonial education had many of the features of education provided during the British rule (Mosha, 2012). Essentially, it was not in the British interests to develop the intellectual abilities of the native Tanzanians. Rather, they designed an education system that they could use only to train the lower and a few middle-rank cadres to serve in the economic sector and administrative structures of the colonial government (Mushi, 2009; Wandela, 2014). These included factory operators, secretaries, and teachers. Characteristically, the education provided by the British emphasised step-by-step learning of task-related skills (Mosha, 2012). Experiential learning through field practice was provided to consolidate knowledge (Mushi, 2009). Because education during the British rule was provided to a very few members of indigenous groups, who were prepared to cover some white-collar jobs, then classrooms were not crowded, and teaching resources were not an issue (Mosha, 2012). Therefore, teachers were able to ensure a step-by-step learning and mastery of role-related skills in the classroom.

Nonetheless, there were complaints about a large part of the content of education inherited from the British rule. Education, during the British rule, was provided on the bases of one's socio-economic, ethnic, and religious status; and had much to do with western interests and experiences (Mtitu, 2014). Neither did the content of the British education reflected local demands and conditions, nor accounted for indigenous knowledge and or experiences they employed in solving daily problems (Wandela, 2014). History, language, and literature, for example, did not contain components that reflect the concrete Tanzanian context and or culture(s) (Wandela, 2014). These, according to Wandela (2014), precipitated charges of epistemological hegemony and cultural imperialism.

Most importantly, education inherited from the British rule was blamed for the reason that it never aimed at advancing the critical thinking skills of native Tanzanians. Rather, it just

aimed at training low-level employees to serve their industrial schemes (Semali & Mehta, 2012; Wandela, 2014). Coupled with the fact that only a few indigenous Tanzanians were able to access this education, the need to re-examine and improve the post-independence education system emerged. Therefore, the post-independence Tanzanian government, according to Wandela (2014), embarked on the first attempt to change its education in the mid-1960s.

This first phase of curriculum reform aimed to resolve the two issues pointed out above. On one hand, it was an attempt to make education accessible to all Tanzanians. As such, most private schools were handed over to the Government between the years 1970 and 1995 (Nzima, 2016; Wandela, 2014). This transfer was boosted with the enactment of the Education Act in 1969, which specifically declared that the State was the only provider of education (Mushi, 2009; Wandela, 2014). However, some secondary schools owned by missionaries were exempted from this movement. Nonetheless, these too had to comply with conditions set forth by the government.

Motivated by what Obanya (1998) refers to as ‘realistic-revolutionary thinking’, another reform attempt occurred between 1970 and 1990 and aimed at ensuring that the Tanzanian context and interests were reflected in the contents of all subject (Mtitu, 2014; Wandela, 2014). That is to say, it was an attempt to ensure that the curriculum had distinctive Tanzanian flavours. From the early 1960s, according to Wandela (2014), Kiswahili was declared to be the medium of instruction in public primary schools while English remained the medium of instruction at the secondary school and tertiary levels.

Major changes in subject content occurred but only in the social sciences (Geography, Language, Literature, and History) (Wandela, 2014). The contents of natural science subjects and, in particular, Biology, Physics, Mathematics, and Chemistry, were least affected given the fact that the Tanzanian government continued to adopt contents for science subjects and related syllabuses from European sources (Mhaiki, 1986; Osaki, 2002). Revisions that were attempted on natural science subjects focused largely on the re-sequencing of various topics and/or adjusting in-depth of contents to match with the new Tanzanian schooling grade-level system (Nzima, 2016).

During the mid-1990s, there was a reduction of subjects at the primary school level from 13 to 7 and the introduction of new transdisciplinary packages at the primary (e.g., life skills and social studies) and secondary education levels (e.g., civic education) (Nzima, 2016). At the end of the 1990s, a distinctive attempt to develop a broad-field curriculum emerged in Tanzania, but this too did not last as it faced significant criticism from the public.

In these attempts, the emphasis was to ensure that instructional practices largely allowed integration of theory and practice. Teachers were required to ensure that what pupils learned in classrooms was field practiced and related to their community. Such an emphasis was largely influenced by the conception of the idea of the ‘Education for Self-Reliance’, a philosophy pioneered by the first Tanzanian president, the late Mwl. J.K. Nyerere, in 1967 (Vavrus & Bartlett, 2013). Essentially, this philosophy, among other things, called for re-designing the Tanzanian education into one that could help graduates to translate knowledge into the real life of the community, particularly village-lives (Wandela, 2014). Nyerere, according to Mushi (2009), insisted on a need for a curriculum to be connected to students’ daily lives. Nyerere, being very eager to see that instructional practices and learning processes were connected to students’ lives, argued:

The question of learning by doing is very important. The best way to learn sewing is to sew; the best way to learn farming is to farm; the best way to learn cooking is to cook; the best way to learn how to teach is to teach.... We learn from the experience of doing. (Nyerere, 1975, p. 3 as quoted by Mushi, 2009, p. 37)

Notwithstanding such efforts and thoughts enshrined in the Education for Self-Reliance philosophy, Nzima (2016) informs that the implementation of changes introduced between 1961 and the late 1990s typically presented a gradual shift from a curriculum intended to be student-centred to one that was more teacher centred. This problem, according to Nzima (2016), was essentially because “internally, curricula were still promoting the learning of academic disciplines” (p. 18). Given that the nature and characteristic of the curriculum continued to focus on content-mastery, the instructional practices likewise focused on the learning of facts and verbal learning processes. Production of knowledge workers was not evident during this period. Factors that created this problem are described next.

First, a large proportion of teachers were not trained well to employ inquiry and student-centred methods in teaching (Wandela, 2014). This problem stemmed from the methods used to train teachers. Mosha (2012) informs us that Tanzanian teachers were prepared in a hurry through the system called abridged teacher-education program. Coupled with the fact that there was a misunderstanding of the idea of Education for Self-Reliance in schools (Osaki, 2002), instructional practice started to emphasise menial manual work rather than focus on the ‘construction of knowledge’ by students. It seemed as if schools were changed into vocational centres as teachers across the country started to organise small-scale and economy-building self-reliance projects such as gardens and farms in the name of ‘hands-on’ learning (Mosha, 2012).

This problem was also influenced by the weakening of the Tanzanian economy during the mid-1980s (Vavrus & Bartlett, 2013). This financial crisis had an enormous impact on the educational sector. Public schools lacked the capability to purchase the necessary teaching and learning resources such as books or laboratory equipment and chemicals (Semali & Mehta, 2012). This problem seemed to be particularly serious in rural areas compared with schools located in urban centres. Consequently, inquiry, student-centred, and other forms of constructivist instructional processes became considerably more challenging for teachers in rural areas (Semali & Mehta, 2012).

The third reason was the examination system. As more students were enrolled in schools and given that the economy started to falter, more assessment weight tended to be allocated on theoretical components compared with authentic problem-solving components (Vavrus & Bartlett, 2013). National examinations were gradually altered to ensure that they did not cost the Tanzanian government much money (Vavrus & Bartlett, 2013). In due course, theory-based assessments took over the place of authentic and laboratory-based ones (Vavrus & Bartlett, 2013). Students in schools that attempted to continue to use the inquiry-based instructional approaches ended up failing the National Examination as they were assessed using an examination system that focused on the memorisation of facts (Vavrus & Bartlett, 2013).

Generally, many change aspects were attempted in the Tanzanian curriculum between 1970 and 2004. Old ideas tended to re-emerge but took on improved forms as reforms

attempts continued. Nevertheless, the literature (Nzima, 2016; Osaki, 2002; Vavrus & Bartlett, 2013) shows that as new reforms continued to appear, an incongruity between the philosophy of Education for Self-Reliance, upon which most of (if not all) reforms during this period were based, and the curriculum designs, actual implementation practices, and the assessment system became apparent.

The more the curriculum was changed, the more the gradual swing into what one could refer to as ‘scholarly academic ideology’ was realised in Tanzania (Mtitu, 2014; Vavrus & Bartlett, 2013). Gradually, curriculum and teaching became the means of enabling children to acquire and master an understanding of subject contents rather than enabling them to extend knowledge and experiences. Eventually, science curricula, contents, and even their instruction language emphasised the rote learning of facts (Nzima, 2016). Accordingly, the classroom learning processes were gradually disconnected from students’ lives and their authentic local experiences (Nzima, 2016; Semali & Mehta, 2012). Teachers continued to fail to encourage students to make sense of the world around them or to connect it with the so-called ‘modern’ sciences in the classroom.

These educational concerns stirred up public discussions on the nature and functioning of the Tanzanian science education. A need arose both to revisit the purposes of Tanzanian education and to redesign the curriculum to shape it in ways that could integrate students’ local lives with the ‘academic science’ to which they were exposed in schools (Nzima, 2016; Semali & Mehta, 2012). There were debates concerning the necessity for schools to promote science, technology, and innovation, with the purpose of building a knowledge-based society, one with capacities and skills relevant for Tanzanian future (Semali & Mehta, 2012). These aspirations resulted in the constructivist (inquiry and student-centred) curriculum in 2005, which in this study is identified as the 2005 Tanzanian Inquiry and Student-Centred Science (ISCS) Curriculum in view of the reasons provided previously in section 1.3.2 in Chapter 1.

2.4.3. The 2005 Tanzanian ISCS Curriculum reform

Today, Tanzania is implementing a new curriculum for a new era, the 2005 Tanzanian ISCS Curriculum. This curriculum was developed to replace the content-based curricula that gradually emerged from the reform attempts conducted in the years 1961 to 2004.

Reasons for bringing about this new reform are both local and global. Locally, many Tanzanians blamed all the curricula implemented prior to 2005 and related examination practices (Mtitu, 2014; Nzima, 2016; Semali & Mehta, 2012; Wandela, 2014) on poor assessment performance. Such blames focused more on the design of these curricula as they influenced teacher-centred or ‘banking’ pedagogies (Nzima, 2016), which ended up producing graduates who could only regurgitate the knowledge they were taught rather than generating critical skills in thinking, extending knowledge, and in applying such knowledge in their real-life contexts (MoEVT, 2007). The previous education system and, in particular, previous curricula, teaching and assessment approaches, tended to encourage students to learn content as facts and regurgitate them from their memory ‘banks’ during examinations (Nzima, 2016). These concerns sparked persuasive voices from the public to demand a new curriculum.

The beginning of this curriculum reform was also a response to the consensus reached by international organisations on what constituted quality education. Towards the late 1980s, international campaigns on creating tomorrow’s schools today by “preparing children to encounter open-ended problems of their life journeys” (Gerver, 2010, p. 43) emerged. Resolutions reached by powerful transnational authorities, particularly the World Bank, the United Nations, and the World Economic Forum (MoEVT, 2007; Mtitu, 2014; Rwiza, 2016), demanded that nations across the entire world reform their education systems into ones that stimulate and engage students in continuous processes of extending experiences, making discoveries, and solving contemporary and particularly authentic problems. The influence of these transnational organisations is acknowledged in the 2005 Tanzanian ISCS Curriculum, which states clearly that “the trend [that existed] in the global socio-cultural-economic relations was pushing the entire world, including Tanzania, towards the so-called knowledge-based society, which is built on creativity, knowhow [or competence], and on [technology and] innovation” (MoEVT, 2007, p. 8). Therefore, apart from being an attempt to respond to local challenges, this reform was also fuelled by the consensus reached by global organisations on what constituted quality education.

2.4.3.1. Key aspects of the 2005 Tanzanian ISCS Curriculum

The development of students' inquiry skills and critical thinking abilities is the prime goal of the 2005 Tanzanian ISCS Curriculum (The United Republic of Tanzania [URT], 2004). Therefore, the salient feature of this curriculum is its pedagogical stance originating from the constructivist ideals. This curriculum invites teachers to place students at the centre of learning by employing inquiry and student-centred instructional practices (MoEVT, 2007). Therefore, the emphasis of the 2005 Tanzanian ISCS Curriculum is more on building new learning habits and enabling children to manage their own intellectual development in an endeavour to become more competitive in the global environment (Mtitu, 2014). This curriculum demands that teachers guide students to describe, utilise, and to integrate their local experience with what is accepted as modern science (MoEVT, 2007). That is to say, the ultimate goal of this curriculum is to provide opportunities for students to interact and integrate out-of-school context-specific knowledge with what we may refer to as 'the already established sciences'. It is a curriculum aimed at promoting 'learning how to learn'.

In terms of design, the 2005 Tanzanian ISCS curriculum is still subject based. Part of this curriculum, which is specific for lower secondary schools, has placed an emphasis on five learning areas. These are Languages, Natural Sciences and Technology, Social Sciences, Business, and Aesthetics (URT, 2007). However, the contents of all science subjects were revised to place more emphasis on various principles required in knowledge development processes. More instructional and learning activities have been suggested to allow students to experience and assimilate abstract ideas and concepts rather than absorbing them as mere discrete facts.

Two additional aspects differentiate this 2005 Tanzanian ISCS curriculum from those it supersedes. First, in order to nurture students' intellectual, scientific, and technological growth and enable them to fit within this ever-changing knowledge world, this curriculum emphasised the teaching of new transdisciplinary issues: Information and Communication Technology (ICT), personality, gender, and sports (MoEVT, 2007; TIE, 2013). Second, the 2005 Tanzanian ISCS Curriculum delineated competencies and skills that students should be guided to develop for them to flourish in this rapidly changing world. These include:

problem-solving skills; critical and reflective thinking; communication; technological literacy; numeracy; independent learning; and, creativity (MoEVT, 2007; TIE, 2013). Given that the ultimate aim of this curriculum reform is also to hinge on the global shift towards education programs that encourage optimal human development (Nzima, 2016), most of these competencies and skills resonate with those published in the world's 21st Century skill list (OECD, 2015).

For teachers to guide students to develop these competencies, the 2005 Tanzania ISCS Curriculum recommends them to use of some specific strategies. The syllabus for each science subject suggested typical activities that can allow students to experience and assimilate abstract ideas and concepts rather than absorbing them as discrete facts. These include, but are not limited to: demonstration; problem solving and inquiry; case studies and research; laboratory practicals and experimentation; debates; and, group discussion (MoEVT, 2007). Nevertheless, no specific 'configuration map' of any of these strategies is provided in this curriculum or the related science syllabuses. Teachers were, and are, also cautioned not to adopt wholesale of the suggested teaching and learning strategies. As illustrated by the 2005 Biology syllabus, this curriculum allows teachers to "formulate others, replace (and modify) some (of the recommended strategies) according to existing realities" (TIE, 2005, p. vii). That is to say, the 2005 Tanzanian ISCS Curriculum provides room for change-leaders and, in particular, SBLs to discuss with science teachers about the acceptable types and levels of adaptation.

The 2005 Tanzanian ISCS Curriculum design was fundamentally adopted from Europe. On these grounds, this curriculum presented significant challenges to Tanzanian teachers and, in particular, of science subjects. Changing from being the typical 'donors' of knowledge to guiders and promoters of self-directed learning is apparently challenging for teachers. Therefore, managing science teachers' transition and, more importantly, ensuring that they grow professionally is very important.

2.5. Leadership of schools

As informed succinctly in section 2.3, the Tanzanian Ministry of Education operates as a typical government bureaucracy but only through generating policy directions on curriculum and students' assessment. According to the Education Act No. 25 of 1978 and

the Education and Training Policy of 2014, each secondary school is managed by a School Board. However, the powers of this board are limited to providing advice on the general development and welfare of a school (MoEVT, 2010). A School Board cannot monitor daily classroom practices. All issues that are related to instructional leadership are handled by the internal leadership team of each school (MoEVT, 2010).

Each Tanzanian secondary school has an internal leadership team that is responsible for the management of instructional-related issues (Kuluchumila, 2014; MoEVT, 2010). In this study, members of this team are referred to as the School-Based Leaders (SBLs). These are the School Principal, the General Academic Master/Mistress (GAM), and the Heads of Department (HoDs) (URT, 2010). Of these, the Principal is the only leader appointed by a higher authority. School Principals are authorised to appoint their GAMs and HoDs from among their teaching staff to assist in leading instruction. School Principals are advised to appoint assistants based on the individual's outstanding experience in teaching as their role is to lead instruction within their schools. The three leaders work as a team in coordinating the curriculum implementation in their school (MoEVT, 2010).

Leading the curriculum implementation process is the principal responsibility of School-Based Leaders (SBLs) in Tanzanian schools. However, the decision-making powers and autonomy of SBLs in Tanzania are very limited. Their responsibility is largely to ensure proper adoption of the curriculum within their schools (MoEVT, 2010, 2013). To achieve this task, SBLs are required to ensure there is a conducive teaching environment within their school (MoEVT, 2010). Part of their everyday tasks include scheduling of teaching timetables, mobilisation of instructional resources, and fair distribution of teaching loads among the staff (Manaseh, 2016; URT, 2010). According to the Secondary School Head guide (MoEVT, 2013), SBLs are required “to coach colleagues how to prepare for classes and to develop their teaching skills (e.g., lesson planning), and they may ask for help from the more experienced teachers (to carry out this instructional leadership task)” (p. 13).

SBLs play a limited role in designing learning programs. They do not have autonomy over staff deployment nor over the selection of textbooks. When more staff are needed, SBLs present a request to higher authorities (URT, 2010). Most importantly, SBLs are required to report the progress of instructional processes and related affairs to higher authorities at

District, Regional and National levels and to the community (MoEVT, 2010, 2013). That is to say, responsibilities of SBLs are largely limited to:

- i. Making suggestions about, (or request to be provided with), human, financial and material support from the higher levels; and,
- ii. Managing whatever they are provided with to ‘improve’ instruction in their school environments (MoEVT, 2010, 2013).

2.6. The position of SBL in transforming schools

A climate in which a policy is developed and implemented is known to introduce a critical dimension through which both school leaders and teachers can exhibit different patterns and behaviours (Louis & Robinson, 2012). One of the factors that characterise a climate of change is the involvement of potential change-users and leaders in the process of bringing about a change (Louis & Robinson, 2012; Ornstein & Hunkins, 2004; Pieters, Voogt, & Roblin, 2019). The more such stakeholders are involved in a change-making process, the more a change agrees with their interpretations and individual orientations, all of which reduce resistance and increase effectiveness of implementation (Louis & Robinson, 2012; Ornstein & Hunkins, 2004; Pieters et al., 2019). Leaders’ response to mandated change, according to Louis and Robinson (2012), tends to reflect a complex interaction between their perceptions of the change context, the specific school contexts in which a change is situated, and their own leadership beliefs and practices.

In Tanzania, the task of reforming educational policies and curriculum is shouldered by the Tanzania Institute of Education (TIE), a division of the Tanzanian Ministry of Education and Vocation Training. TIE is also responsible for providing in-service teachers with professional training. However, possibly because of financial constraints, TIE has been training teachers largely using a cascade strategy (Kopweh, 2014). That is, professional development concerning change is at first provided in patches to SBLs and a few teachers (Kopweh, 2014), who are, in turn, required to guide their colleagues in their own school contexts.

Irrespective of whether, or not, SBLs have a very low understanding of, and autonomy on, change, they are still required to be transformers of teaching within their schools (MoEVT, 2010). SBLs are required to generate environments and opportunities for colleagues to transform their instructional practices to match with the demands of a new curriculum (MoEVT, 2010). It is clear that this requirement is intensive and challenging for SBLs. The position of SBLs within the broader landscape of the Tanzanian educational management system and levels of their awareness of curriculum reforms may influence how they guide the adoption in schools. Coupled with the fact that change leadership styles and practices often covary with school-contexts, with individual capacity to lead, and with experience in new curriculum and pedagogy (Fullan, 2014; Hallinger & Huber, 2012; Louis & Robinson, 2012), we may observe substantial variations in the way teachers are guided to implement the 2005 Tanzanian ISCS Curriculum among Tanzanian schools. This likelihood is strengthened by the study of Opweh (2014) and Nzima (2016), all of which found teachers having limited awareness of this curriculum. That is to say, there is a need for a study to illuminate change-adoption leadership processes and experiences of SBLs in Tanzanian schools, and this is the mission of this study.

2.7. Chapter summary

This chapter presented an overview of the Tanzanian education and various changes it has gone through from independence to 2005. The chapter covered historical antecedents, and this aimed at demonstrating the context from which the 2005 Tanzanian ISCS Curriculum was derived. Information about the context in which the new Tanzanian curriculum is currently implemented was also presented. This information aimed at portraying the setting in which School-Based Leaders (SBLs) and teachers, particularly secondary school science teachers, are dealing with this new curriculum. The next Chapter presents a review of the literature deemed pertinent for this study.

Chapter Three: Literature Review

3.1. Introduction

This chapter presents a review of the extant literature relevant to this investigation. The reviewing process includes substantial information from both theoretical and empirical sources related to the adoption of educational change. For the sake of historical entirety and for situating the current educational change literature in this background, the review includes some pioneering works conducted in the 1970s and 1980s. However, this review mainly covers literature developed during the past two decades as this is considered to be when the field of educational change was broadly developed. It is worth noting also that this literature largely comes from developed countries, particularly Europe, Australia, and America. These are places where leading theorists and researchers of educational change have been working and publishing.

The first part of this review is an extension of Chapter 1, and this is aimed to create a link between this and the previous chapter. An overview of the change process is subsequently presented, detailing its legacy, complexity, and its contribution to our understanding of the change-adoption process. The review will then turn its attention to issues of intervention and institutionalisation of educational changes in schools, and this is aimed at depicting the position of School-Based Leaders (SBLs) in this undertaking. This section is followed by a succinct overview of the Concern-Based Adoption Model (CBAM), one of the conceptual models used to investigate the level of adoption of educational changes. The summary of this review presents a conceptual framework to demonstrate the links between the literature and goals of this study.

3.2. The reform agenda

Change, reform, and innovation are three key terms used interchangeably in the literature when discussing the issue of educational improvement. In this study, these three terms are also used interchangeably to refer to transformations and realignment of practices, values, and beliefs involving individuals or an entire institution or system for improving education

outcomes (Fullan, 2011). ‘Educational change’ is defined in this way to equate it with a biological process that keeps species evolving for their survival.

The world has continued to witness different designs of education changes, and Chapter 1 has detailed some of the reasons and targets for their outset. Basically, educational changes have been introduced many times. The four waves of change presented by Pea and Collins (2008), three phases summarised by Hopkins and Reynolds (2001), and the trend of change depicted by Hargreaves and Shirley (2009) exemplify these movements. A closer scrutiny of change attempts shows that previous ideas concerning education have often re-emerged albeit in slightly improved forms, making reform processes to be sometimes equated with a pendulum that swings back and forth. This argument is supported by the ongoing world-wide efforts to change science curricula from a content-based design to competence-based, outcome-based or performance-based designs (Le, Wolfe, & Steinberg, 2014), all of which appear to be like the extension of the fourth wave of change described by Pea and Collins (2008). This wave of change is aimed at influencing teachers to replace the traditional (teacher-centred) instructional practices with constructivist ones (Mkimbili, 2018; Schreurs & Dumbraveanu, 2014), and the belief is that the success of students’ learning is improved when there is a personalization of learning.

Despite considerable investments devoted to improving educational effectiveness, the most dominant theme in the literature is that educational reform attempts have achieved limited success in transforming teaching and learning (Hargreaves & Shirley, 2009). Most research reports regarding the adoption of constructivist teaching (Fitzgerald, Danaia, & McKinnon, 2017; Hume & Coll, 2010; Mkimbili, 2018) depict the gap between policy desires and the real instructional practices in schools. This failure is equally reflected in reports from most employers and international organisations concerning the disappointing levels of capability of graduates (Burner, Supinski, Zhu, Robinson, & Supinski, 2019; Cedefop, 2015; Ernest, 2014; OECD, 2015; UNESCO, 2016). In view of these, there is a general agreement that most schools have largely remained the same, and this suggests that the question of how to transform schools is far from clear.

The prominent change theorists (e.g., Fullan 2001; Hall & Hord, 2015; Rogers, 2003) have written extensively about the issue of low levels of change adoption. Rogers (2003) notes

that many change attempts encountered implementation problems, thereby lessening their intended impacts. Hall and Hord (2015) inform us that while most changes fade away, some have stayed but they have not led to any considerable instructional transformation. Fullan (2001) adds to this, stating that most educational reforms, although well intended, have had only intermittent success. Pockets of success have been observed and celebrated in some schools, but scaling them up to the system levels has proven to be very elusive (Fullan, 2001).

The fact that attaining successful educational transformation has continued to be an elusive endeavour has prompted change designers to find out the reasons. Attempts to respond to questions about why there is an unsatisfactory transformation in school systems and why it has been so difficult to scale-up programs that worked well in some schools has resulted in an evolution of extensive literature and, as McKinnon, Sinclair, and Nolan (1997) stated, with much of its attention being on the roles that are expected to be played by teachers and school leaders. This literature is briefly discussed in the next sections.

3.3. The process of change

Efforts to understand educational change processes have a long history and can be traced as far back as the foundational work of Ryan and Gross (1943) at Iowa State University in the U.S.A. regarding the adoption of hybrid corns (Hall & Hord, 2015; Valente & Rogers, 1995). This study aimed at finding out how to persuade or educate farmers to adopt varieties of hybrid corn. The study's notable findings included the rate at which farmers adopted the hybrid varieties and how social interactions of farmers promoted this process.

Having paid additional attention to the personal dimension of change, particularly how an individual deals with new proposed ideas and practices, Fuller (1969), Hall, Wallace, and Dosset (1973), Hall, Loucks, Rutherford, and Newlove (1975), and Hall and Loucks (1977) extended such studies into the education field. Findings from these initial studies about the educational change process have also been extended by other researchers (e.g., Bridges & Mitchell, 2000; Hall & Hord, 2015; Rogers, 2003). Overall, previous studies concerning adoption of educational changes have informed us much about the rate of adoption and factors that influence this process.

It is clear that, whether well-planned or not, the educational change process is not linear. While theorists suggest linear change adoption phases such as initiation, implementation, and continuation (Fullan, 2001) or unfreezing, moving to the new situation, and re-freezing (Bridges & Mitchell, 2000; Rogers, 2003), which makes change to appear like an overnight event, there is evidence to suggest that change is a difficult and complex process. For such reasons, Hall and Hord (2015) argue that conceptualising change is the first and easy step compared with transferring and sustaining it in real-world settings.

Prominent theorists of change such as Fullan (2001) inform us clearly that “the total time from initiation to institutionalisation of change is lengthy” (p. 52). It can take even up to 10 years to institutionalise an education change but achieving a satisfactory adoption can still be hard (Fullan, 2001). According to Hall and Hord (2015), it is not surprising to find a low adoption rate because teachers’ use of change is influenced by myriads of professional factors rather than simply the presence of (or access to) the proposed change. Bridges and Mitchell (2000) suggest that this lack of rapidity tends to emerge because of the numerous challenges experienced by users in their attempts to deal with change.

Factors that delay adoption of innovation and, in particular, that influence resistance, are abundant and include teachers’ judgment of the extent to which the innovation is deemed practical in their settings, its efficiency considering available time and resources, and their efforts compared with the one it supersedes (Marsh & Wills, 2007; Ornstein & Hunkins, 2004). Fullan (2001) refers to this behaviour as ‘pragmatic scepticism’. Therefore, when teachers feel that their school situation is ‘unsafe’ or not ready for change adoption, they are likely not only to resist a proposed change but also to become defensive and continue with their well-entrenched previous practices.

Perhaps the most important factor that hinders adoption is the conflict between the interest that characterise the personal part of change and the demands of the change (Hall & Hord, 2015). This conflict transpires in part because of the mismatch between change suggestions and teachers’ views of what was (or was not) required to change; failure to understand the meaning of change (Fullan, 2001), especially considering that “humans are fundamentally motivated to do things that are intrinsically meaningful to themselves” (Fullan, 2014, p. 7); and, teachers perceptions regarding the degree to which change suggestions fit with their

personal values, needs, attitudes, and preferences (Fullan, 2001; Hargreaves & Fullan, 2012). That is to say, unless teachers understand and appreciate the need for change, their interest in keeping the *status quo* will take precedence over their willingness to change.

Hall and Hord (2015) believe that reactions to reform based on personal grounds rather than on professional dimensions dominate the initial change adoption stages, especially when change requires adopters to think differently about their practices. Reactions based on personal dimensions tend to dominate in part because teachers, according to Fullan (2001), most often perceive and interpret change as criticisms of their practices. On these grounds, Hall and Hord (2015) and Fullan (2001) emphasise that initiating change without having reasonably ‘convinced’ teachers that it is vital to abandon the ways of teaching to which they are accustomed results in adoption problems. That is to say, a secure sense of self is indispensable in the successful change process.

Overall, research has shown that the factors influencing rates of adoption are probably countless and, in most cases, they emerge spontaneously. A study conducted very recently in Australia by Fitzgerald et al. (2017) has shown that the adoption of innovation among teachers was simultaneously influenced by: (i) the lack of resources enabling the adoption of change; (ii) the failure to understand the meaning of the change; and, (iii) the limitations presented by the characteristics of the innovation. Similar problems have been reported in studies conducted in developing countries such as Tanzania (Mtitu, 2014; Nzima, 2016).

Given that teachers’ backgrounds differ greatly, and since they can be at different stages of their professional growth, there are multi-faceted ways in which they respond to changes (Fullan, 2001; Hall & Hord, 2015). Therefore, it is crucial for change leaders to recognise and harness such differences as potential resources in influencing the adoption of change. Change leaders must not only be aware of this issue, but also plan to manage the transition for all involved (Fullan, 2001; Hall & Hord, 2015).

While adoption of change remains a fraught process with little guarantee of success, the literature indicates that allowing users to persist with an innovation and guiding their views about it are the best approaches to promoting adoption. When adopters are allowed to stay with the innovation with minimum pressure, they get enough time to “reflect on new goals, to consider new learning contents and practices, and to try out the new tasks” (Ornstein &

Hunkins, 2004, p. 302). Learning about the change is necessary because the “the meaning of change will rarely be clear at the outset” (Fullan, 2001, p. 31) and adoption improves only when users have managed to solve a large part of their concerns that may have slowed their initial implementation (Fullan, 2001; Hall & Hord, 2015).

It is worth mentioning, however, that there is no standard duration for users to achieve a complete transition, and that the change process is not linear. Because change necessitates people to abandon ways that seemed to work in the past, to explore new ones, and to begin to behave in entirely new ways, the transition process tends to occur “much more slowly than change” itself (Bridges & Mitchell, 2000, p. 2). Most importantly, the transition rate is very unpredictable (Hall & Hord, 2015). Given these realities, a question most often asked is: why is it so challenging to create and institutionalise change in schools? (Hall & Hord, 2015). As we continue to search for answers to this question, theorists have proposed many strategies to speed up the rate of adoption of educational changes, and one of these relates to change or change-adoption leadership. This concept is discussed in the next sections.

3.4. Importance of guiding change adoption

Change remains a fraught process with little guarantee of success because of the reasons discussed previously, and which include conflicts in interest that characterise the personal part of change (Hall & Hord, 2015), teachers’ failure to understand the meaning of change (Fullan, 2001), and the practical dimensions of change. Given these realities, Fullan (2001) and Hall and Hord (2015) suggest that depending on teachers themselves to take charge of the process of changing their own deeply entrenched classroom instructional practices and beliefs can be an ineffective approach. Therefore, mechanisms to solve problems related to the meaning of the change are crucial for success.

Many academics (e.g., Fullan, 2011; Fullan, 2014; Hallinger, 2011; Hargreaves & Fullan, 2012) discuss the issue of managing the transition process as an important way of moving change adopters out of their comfort zones. Guiding change helps the change adopters to say goodbye to their former ways of working, to explore new ones, and to start to go on with the introduced change (Bridges & Mitchell, 2000; Hall & Hord, 2015). With appropriate supports in place, Bridges and Mitchell (2000) and Hall and Hord (2015) emphasise that, adopters can start to implement the change more smoothly and less

obtrusively. Powerful resistance to change, according to Fullan (2001), occurs where leaders do not explain to adopters what the change is, why change is occurring, and why change is imperative.

Recent studies, particularly that of Hallinger and Huber (2012) and Leithwood, Patten, and Jantzi (2010), back up the aforementioned theorists by illustrating that when school leaders are committed, the school improves. Experienced school leaders tap teachers' dispositions and readiness, and use these to boost the adoption of changes (Leithwood & Louis, 2012). From this point of view, it is clear that researchers and theorists agree on that a school leadership can play a significant role in making teachers more comfortable with adoption of change, particularly by providing them with pertinent information about ways in which the change will affect them as well as what is expected of them in facing it.

As stated previously, this study focuses on School-Based Leaders' (SBLs') practices of managing and guiding science teachers' adoption of an innovation in schools. Therefore, the next sections detail the literature in this area. Part of the conclusion of this chapter will deal with the literature concerned with the assessment of levels of adoption of change as this is necessary to determine the effectiveness of the change leadership process.

3.5. Guiding adoption of change in schools

Facilitation of adoption of mandated educational changes can be carried out by different agents. Nevertheless, most researchers (e.g., Hall & Hord, 2015; Hallinger & Huber, 2012; Hargreaves & Fullan, 2014; Fullan, 2014) indicate that principals and other school leaders can develop a meaningful link between the mandated change and the implementers at the classroom level.

One of the factors that emphasise the importance of principals and other SBLs in guiding change in schools, according to Paton and McCalman (2008), is our deeply entrenched belief that they are more aware of changes than other staff members in a school. SBLs are believed to be more aware of changes largely because they often participate in processes of bringing them about or are introduced to changes before their implementation is officially announced (Paton & McCalman, 2008). Each of these opportunities permits SBLs to be more acquainted with the required transitioning steps compared with other staff members

within a school, thus placing them in a suitable position to support and guide colleagues in their implementation of changes.

Perhaps more importantly, SBLs are appropriate for guiding changes in schools because they work closer to resistant adopters compared with the change designers (Fullan, 2001, 2014). Based on their positions, SBLs are more likely to know the behavioural norms and cultures of teachers better than anyone else within a school (Paton & McCalman, 2008). Coupled with their experience in both teaching and leadership, SBLs' position in a school permits them to know with whom they should establish preliminary communication for the diffusion process to be effected smoothly and speedily. SBLs are in the best place to identify: what and how resistance looks like; from which colleagues resistance to change is likely to start; and, the bases of that resistance (Hall & Hord, 2015). That is to say, when SBLs have acquired what Fullan (2014) refers to as "professional capital" (p. 67) through training and experience, they are best positioned to manage actively any resistance when it occurs, leading to a very smooth beginning of the implementation of change.

3.5.1. Defining school-based leaders (SBLs)

The idea of using SBLs as agents for the institutionalisation of change and improving its implementation in schools has its origins in the 'effective school' studies conducted during the 1970s (Edmonds, 1979; Weber, 1971). These studies investigated why and how some schools increased their performance. Their research findings have been replicated further by many researchers (Drysedale & Gurr, 2011; Moos, Johansson, & Day, 2011; Mourshed, Chijioke, & Barber, 2010) to gain a comprehensive understanding of the characteristics of schools that are achieving outstanding results. Overall, results from effective school studies illustrated that principals of the most successful schools 'monitored' instruction processes and provided compelling instructional guidance compared with those in lower performing schools. The common conclusion that emerged from this body of research is that a school is likely to improve if its principal has a considerable level of experience in teaching and is extremely committed to bringing about high levels of school improvement.

While school principals remain key in schools, further research concerning successful schools (Hord, Stiegelbauer, & Hall, 1984; Neumerski, 2013; York-Barr & Duke, 2004) demonstrated the notable contribution of assistant principals and other expert teachers in

guiding implementation of educational programs in schools. Having substantial experience in teaching and transition processes, some faculty members operate as “peer interpreters, disseminators, and models” for their colleagues (Hord et al., 1984, p. 96). That is to say, when the context allows, some staff members can work as resource teachers, mentors, and as change agents to facilitate transition from one to another educational practice.

Recent studies have established factors that impede principals from providing adequate instructional leadership, particularly concerning change, on their own. Manaseh (2016) and Lochmiller (2016), for example, revealed that there are essential differences across subject areas that create challenges for principals to work as sole facilitators of change transitions. These studies demonstrate that principals fail to offer satisfactory instructional guidance for subjects they were themselves not trained to teach. Principals who attempted to guide implementation of subjects that were not in the domain of their specialisation, largely did it from what Lochmiller (2016) refers to as “a generalist stance” (p. 90) given that their guidance tended to be reflected by their own teaching-subject domains. More importantly, principals, according to Fullan (2014), face a challenge of balancing regular administrative responsibilities and those related to the leadership of curriculum. Lochmiller (2016) and Manaseh (2016) found most principals tending, or being required, to allocate more time and effort to fulfilling administrative responsibilities than for instructional supervisions. Consequently, their leadership of instructional change was ineffective across the studied schools.

Research regarding change leadership within schools has continued to occur (e.g., Gurr & Drysdale, 2013; Javadi, Bush, & Ng, 2017; Neumerski, 2013; York-Barr & Duke, 2004), leading to an agreement that even the best principal cannot manage and transform a school alone. The impact of school principals’ leadership, according to the study carried out by Leithwood and Jantzi (2006), is about 5-7% while that contributed by the entire staff is 27%. Bush and Glover (2014), in adding emphasis to this issue, comment that the days of the lone leader are over. They no longer believe that one school administrator can serve as the only instructional leader without the considerable support of others (Bush & Glover, 2014). Fullan (2014) emphasised further, stating that even great principals, one by one, will never change schools.

Harris and Muijs (2007) advocate that school improvement occurs when someone within a school initiates or promotes a certain direction of change. Essentially, Harris and Muijs (2007) agree with many other change theorists (e.g., Fullan, 2014; Gurr & Drysdale, 2008) on that issue insofar as neither school principal nor head of a department alone can handle all of the change leadership responsibilities independent of the other. Fullan (2001) is of the opinion that change in schools occurs when any person exerts an ‘intentional’ influence over others to accomplish a common goal. Therefore, while a large part of the traditional literature concerning change focused on the principal as the single accountable person, it is increasingly being accepted that the leadership distribution within a school is very critical to promoting the school’s effectiveness in implementing change.

In defining formal curriculum leaders within a school, Harris and Muijs (2007) and Gurr and Drysdale (2013) consider three major subcategories: school principals; heads of department; and, curriculum coordinators. Collectively, these constitute what academics refer to as instructional leaders (Hallinger, 2011), change agents (Hall & Hord, 2015), and as school-based leaders (Harris & Muijs, 2007). Essentially, change theorists insist that the position of a staff member on the school's organisational chart does not matter. Rather, what matters most is that there are volunteers who assist, support, and nurture the change process within a school.

3.5.2. Approaches to change leadership

The public expects leaders of schools to commit their efforts to the school improvement by influencing quality instruction. This expectation is central during major reforms as efficient leadership is believed to influence the success of educational transformations in schools. Therefore, while the failure of a change initiative is influenced by numerous factors, most leading academics, particularly Edmonds (1979), Drysdale and Gurr (2011), and Fullan (2014), believe that weak school leadership is one of the strongest reasons. This thinking has resulted in a broad educational-change literature addressing how SBLs perform or should perform their instructional leadership tasks, especially when guiding the adoption of educational change. The diversity of approaches to change leadership, according to Fullan (2014), emanates from the fact that change is a multidimensional entity. Nevertheless,

most theories concerning change leadership share several common elements and they tend to supplement each other.

In discussing the responsibilities of SBLs in guiding implementation of change in schools, theories of leadership and the related research have gone through significant changes in focus from seeking to explain what leaders are, to what they do. While the literature about the use of SBLs as change agents spans several decades, the remarkable contribution in part comes from Hord et al. (1984) and Hallinger (2005). These academics extended and elaborated the foundational work of Edmonds (1979) about the actions to be exhibited by school leaders in facilitating the implementation of educational changes, suggesting that school leaders should:

- (i). offer direct assistance through clinical observations and consultations;
- (ii). coordinate and organise logistics for the smooth conduct of teaching activities; and,
- (iii). build a positive learning climate such as promoting collegial supportive relationships among teachers within a school. (Hallinger, 2005; Hord et al., 1984).

Other researchers of effective school studies (e.g., Drysdale & Gurr, 2011; Moos et al., 2011; Mourshed et al., 2010) have elaborated further these functions, suggesting that effective change leaders in schools are role models, coaches, liaisons, administrators, managers, and importantly, communicators of change. Day, Gu, and Sammons (2016) have added that school leaders are responsible for defining the vision of any change, directing and supervising it, and for establishing discipline, negotiating, motivating, and facilitating transition.

Essentially, the growth in the importance of change leadership in schools over the past two decades has resulted both in change-theory development, and in refining traditional school leadership models. Therefore, the list of leadership descriptors is very extensive (Moos et al., 2011) and, according to Mourshed et al. (2010), the leadership descriptors vary only very slightly whether it is about the leadership of internally initiated change or when it is about change imposed by external agents.

After having explored the significance and tasks of change leaders within schools, the next sections present review of the literature on leadership strategies and approaches. Basically, many theorists and researchers of educational change have attempted to develop different dimensions of the leadership (i.e., styles and strategies) required for managing educational changes. The current review, however, covers three board approaches, namely:

- (i). managerial;
- (ii). instructional; and,
- (iii). transformational leadership.

While instructional and transformational leadership are mostly linked to effective change leadership, it was deemed pertinent to include the managerial leadership model because it is also reported in the educational change literature as being a common one.

3.5.2.1. Managerial leadership of change

This traditional leadership model defines school leadership as being focused on a single or very few individuals occupying positions of formal authority (Day et al., 2016; Earley & Weindling, 2004). This managerial leadership model is inclined towards the structuralist and mechanistic view, emphasising the establishment of clear direction to be followed to achieve a predetermined agenda (Day et al., 2016). This mechanistic view of leadership of instructions and adoption of change considers SBLs as being administratively empowered to control, manage, and, most importantly, to ensure that teachers comply with any agreed standards (Earley & Weindling, 2004). This leadership model, according to Fullan (2014), is based on accountability assumptions in that “the most important thing to do is to make sure that a person down below acts in line with directions passed down by someone higher up” (26). Positional power in combination with formal policies and bureaucratic procedures, according to Earley and Weindling (2004), are what influence SBLs to prefer managerial leadership in schools. The school leadership, in this case, is a personal and an individualised activity.

Being responsible for raising students’ and schools’ achievement, SBLs viewed in this way are expected to rely, in large part, on their positional powers to protect instructional time within schools and to provide teachers with resources that keep them focused on teaching (Day et al., 2016). Supervision and monitoring of instruction appear to be the dominant

ways in which SBLs exhibit their positional powers in managing implementation of new educational programs as these practices, according to Fullan (2014) are highly associated with greater efficiency. Through observation and inspection of teachers' instruction, which are among the most commonly reported instructional supervision practices (Fuss, 2018; Mngomezulu, 2015; Nzambi, 2012), school leaders acquire information about the ways in which teachers deal with change, and this allows them to 'enforce' both accountability and efficiency.

Managerial leadership of instruction is inspector-type, compliance-oriented, directive, and its main focus is on completion of assigned teaching responsibilities and compliance rather than on the quality implementation of change (Bush & Glover, 2014). Yukl (2012) is of the same view, adding that managerial leaders exhibit one-way communication and focus more on ensuring compliance, with the assumption that behaviours, functions, and the teaching task are rational. Perhaps based on this similar view, Bush and Glover (2014) note that managerial leaders: (i) place more emphasis on the completion of a task rather than on the quality of it, and (ii) pay limited attention to their relationship or to the rich conversations with faculty. These, according to Bush and Glover (2014), increase the likelihood of subordinating leadership to the managerial sensations of greater efficiency.

Fullan (2014) and other leading instructional leadership theorists (e.g., Bush and Glover 2014; Glickman, Gordon, & Ross-Gordon, 2018; Gurr & Drysdale, 2008) criticise attempts to solve system problems with authoritarian and individualistic strategies alone. These academics are of the opinion that tightening the bureaucratic links from principals down to teachers is less productive as it influences teachers to game the system. Nonetheless, their criticisms do not intend to discourage the use of managerial practices in leading change in schools. Fullan (2014) reminds us that leading school transformations also "requires strong managerial skills" (p. 56) as "establishing routines is essential for improvement goals to succeed" (p. 57). Given that demarcating distinctions between leadership and management of change is difficult, the important things, according to Fullan (2014), is for school leaders or change agents to focus more on leading learning by resourcing strategically and build relational trust.

Management of change, in consideration of the previous discussion, shifts from being completely operational to more learning-centred when positional authority is employed strategically to create a low threat and an open-to-conversation atmosphere (Leithwood, Harris, & Hopkins, 2008). This argument has led to the conception of instructional and transformational leadership models, the so-called more advanced change leadership frameworks (Hallinger & Huber, 2012; Leithwood & Jantzi, 2006).

3.5.2.2. *Instructional leadership of change*

The instructional leadership concept emerged during the 1980s (Hallinger & Huber, 2012). The difference between managerial and instructional leadership models is not very clear as broad reflections of instructional leadership tend to include hierarchical and supervisory tones (Glickman, Gordon, & Ross-Gordon, 2018). This is perhaps why Hallinger's (2011) elucidation of instructional leaders' tasks included those related to management, viz., setting expectations for teachers, supervising instruction, and monitoring student progress. Notwithstanding the fact that this leadership model also focuses on school principals as the centre of expertise, power and authority, it is believed to be a 'learning-centred' approach to leading change in schools compared with the previous model (Bush & Glover, 2014; Day et al., 2016; Leithwood & Jantzi, 2006).

Considering this model as learning-centred is because its focus is mainly on improving standards of instruction through communication (Elving, 2005; Glickman et al., 2018). Instructional leaders use information they gather during instructional monitoring activities to guide the adoption of changes, primarily by clarifying adoption concerns and suggesting alternative practices (Glickman et al., 2018; Gurr & Drysdale, 2008). As such, instructional leaders are commonly referred to as "pedagogical leaders" or/and "curriculum leaders" (Leithwood & Jantzi, 2006, p. 4).

Monitoring focused on encouraging learning, 'leadership for learning' as referred to by Hallinger and Heck (2010) is largely recommended in guiding change adoption, especially because research (e.g., Fuss, 2018; Hallinger & Heck, 2010; Ho, 2010; Trinter & Carlson-Jaquez, 2016) relates it with improved implementation of change. This form of leadership is consistent with notions of 'constructive leadership' (Harris & Muijs, 2007) and "leading learning" (Fullan, 2014, p. 8) as all of these require school leaders to support improvement

of instruction within schools by providing teachers with feedback that is open to collective analysis.

Given the fact that this leadership framework calls for leaders to continually ‘guard’ each teacher individually, Fullan (2014) is of the opinion it is unproductive for the school-wide growth. Factors working against leaders getting into classrooms are many, varied, and very difficult to overcome. First, and as supported by Little (1990), classrooms are traditionally private kingdoms of teachers in which school leaders may not always be welcome. Second, school leaders lack expertise for subjects they were not trained to teach, and therefore, they cannot supervise the implementation of all subjects. Importantly, it can be incredibly time-consuming for leaders. Fullan (2014) discusses that “supervising individual teachers into better performance is difficult if you have a staff of, say, more than twenty teachers” (p. 40). It is on these grounds that this change leadership model, according to Fullan (2014), is also “too narrow” (p. 38) given that it shuts out other dimensions of leading learning.

Research investigating the influence of school leaders’ practices on staff learning culture and school effectiveness (e.g., Hallinger, 2011; Hallinger & Heck, 2010; Hargreaves & Fullan, 2012; Leithwood et al., 2010) suggests that leading for learning is more likely to be brought about by transformational leadership approaches. These leading researchers agree with Fullan (2014) on that while formal SBLs can provide part of change leadership within a school, teachers must themselves assume an increasing level of decision-making powers over a proposed change if long-lasting transformation is desired. The next section details this dimension of change leadership.

3.5.2.3. *Transformational leadership of change*

Transformational leadership involves building a culture for reform and transpires when leaders and followers advance one another (Hallinger, 2011). Assuming that everyone working in a school is potentially an agent of change through the contribution of her/his skills, attitudes, and experiences in change processes and school contexts, this leadership model, according to Leithwood and Jantzi (2006), calls for the creation of a low-threat and rich-in-conversation atmosphere. Rather than being absorbed in the task completion theme, transformational leaders are sensitive to values, feelings, and the contexts involved, and they pay additional attention to the process through which a task is performed (Hallinger,

2011). The responsibility of a leader is to create and sustain a culture that welcomes new ideas from frontline teachers and is safe for the entire faculty to take reasonable risks to try them (Leithwood & Jantzi, 2006). That is to say, transformational leaders consider that empowerment of all staff members is crucial for change adoption.

Leithwood and Jantzi (2006) note that this leadership model encourages faculty members to take increasing ownership of adoption leadership to supplement the leadership provided by formal leaders. Harris and Muijs (2007) and Hargreaves and Fullan (2012) agree on this discussion, adding that when there is staff-wide responsibility, school leaders not only share autonomy with teachers over decisions they make regarding the adoption of change within a school, but they also allow teachers to control their professional growth. That is to say, a sustained change is dependent on the mix of individual skills as well as the strength of the collective efforts within a school.

To enable staff members to experience possession of an equal voice and the opportunity to engage in productive professional dialogue requires leaders to employ more sophisticated methods (Fallon & Barnett, 2009; Ho, 2010; MacBeath, 2005) such as tactical organisation of staff to cultivate and promote ‘greater’ leadership density and empowerment of teachers in schools. Broad terms such as team-oriented leadership, communities of shared practice, shared leadership, and professional learning community are frequently found in the school and/or change leadership literature (Hallinger & Heck, 2010; Harris & Muijs, 2007; Ho, 2010) to denote the impact of such leadership practice in schools.

One of the strategic ways of encouraging staff-wide responsibility in change adoption is by developing a positive interaction climate within schools, which Fullan (2001) refers to as “a culture for reform” (p. 44). Leithwood and Jantzi (2006) refer to this process as the “redesigning the organisation” (p. 205), adding that it includes developing structures that promote participation of the entire staff in pedagogical decision-making processes. Fallon and Barnett (2009) provide compelling findings on the impact of the tactical organisation of staff on reduced isolation of teachers within a school. When transformational leadership practice is present within a school, previous studies (Hallam, Smith, Hite, Hite, & Wilcox, 2015; Johnson et al., 2014; Sagnak, 2016; Somech, 2010) show that the professional life of that school is characterised by a culture and climate of openness to improvement, trust and

united focus, a sense of purpose, and the perception that everyone has the necessary skills to facilitate the adoption of change. Fullan (2001) recommends that school leaders build this culture in their daily leadership undertakings given that accomplishing successful adoption of change is a learning process, and since shouldering the entire adoption leadership task alone tends to frustrate leaders.

Recurring themes in past research (e.g., Awbery, 2014; Ho, 2010; Johnson et al., 2014; Sagnak, 2016; Somech, 2010; Stosich, 2017) agree with theorists such as Hord (2009), Hallinger and Huber (2012) and Fullan (2014) on that a culture of change is created when there is professional and reflective dialogue within a school. Essentially, this leadership practice is a characteristic feature of what Stoll, Bolam, McMahon, Wallace, and Thomas (2006) call a 'community of practice'. A similar view was raised by Johnson et al. (2014), emphasising that for an educational change to be adopted effectively by teachers, the entire staff needs to be involved in pedagogical decision making, albeit to varying degrees, as this practice tends to allow them to develop a sense of ownership of the recommended change. In summary, while schools continue to exist in a bureaucratic system, the leading theorists (e.g., Fullan, 2014; Gurr & Drysdale, 2008; Hallinger & Heck, 2010; Harris & Muijs, 2007) recognise that the engagement of the entire staff in the pedagogical decision making processes is a key condition for the success of any reform.

As a 'hands-off' leadership strategy, collaborating with other staff members is believed to broaden the 'leadership density' in a school as every member has a chance to contribute their experiences and ideas about change to the adoption (Hallinger & Huber, 2012). That is to say, this model of change leadership in schools assumes that school principals cannot by themselves create the entire conditions necessary to transform a school. Rather, and as emphasised by Harris and Muijs (2007), Gurr and Drysdale (2013) and Fullan (2014), the effective leadership of adoption is a shared process that involves collaborating with a range of other staff members.

The importance of this leadership approach is particularly revealed when formal leaders are not very experienced in championing change within a school. In such situations, Tam (2010), Sagnak (2016), and Stosich (2017) reveal that the involvement of staff members in discussions about change and its adoption promotes experiences and creative views about

such aspects to emerge from even the least experienced staff. In the long run, this practice catalyses and empowers ‘informal teacher leadership’ systems to develop, thus increasing the leadership density within a school (Harris & Muijs, 2007), which is another crucial element of successful change.

Perhaps more importantly, when the entire faculty is engaged in discussions about how compelling instructional practices look like, there is evidence that teachers feel valued and recognised (Johnson et al., 2014), and these perceptions boost their ‘self-efficacy’ and morale in dealing with change (Sagnak, 2016). Furthermore, such involvement practices allow faculty members to own the change, which, according to Fullan (2001), is essential as teachers prefer to be part of the change rather than feeling controlled by it. Through their studies, Stosich (2017) and Johnson et al. (2014) have shown that in schools where SBLs allowed teachers to have a great deal of input in making decisions about adoption, there was a sense of equity and caring in dealing with change, and these were essential aspects to the establishment of a culture for change. These studies indicate that the more school leaders increased their interaction with teachers and among teachers themselves on the business of teaching, the more they were likely to influence frontline teachers to think about change and its adoption in their schools.

Hargreaves and Fullan (2012) and Fullan (2001) maintain that school leaders who seek to engage staff in pedagogical discussion succeed in developing a shared understanding of reasons for initiating change and in increasing ownership of that change among the staff, all of which reduce both the lack of commitment and resistance to change. Therefore, it is recommended that wide-ranging distributed-leadership practices in schools be embraced, particularly during the times of attempting to adopt new education program.

Another strategy through which leaders may promote a community of shared practice in schools is by developing a culture of collegiality. Fullan (2014) believes that collegial interactions provide primary opportunities for peers to support one another. Fullan (2014) emphasise building the social capital of teachers working together to be the main role of SBLs. The best way to lead change and foster expertise at scale, according to Fullan (2014), “is to use the group to change the group” (p. 84). The studies conducted by Ford and Youngs (2018) and Awbery (2014) illustrated that collegial interactions allowed

faculty members to engage continuously in constructive discussions on the meaning of the innovation and to share their insights, experiences, and concerns about it on more collegial grounds compared with when SBLs control this vital process. Fitzgerald et al. (2017) revealed that fellow teachers can form powerful groups to promote adoption of change, but this is dependent on leaders' construction of supportive opportunities. In summary, theorists and researchers agree that the more adopters interact with each other, the more they are in a better position to decide whether to accept or reject, and/or modify some of the innovation aspects, and that the quality of interaction is strongly related to implementation success.

While transformational leadership is critical to the adoption of change in schools, Harris and Muijs (2007) and Fullan (2014) alert us to the difficulty of establishing this culture, suggesting that very few schools in the world fit this ideal picture. Given this difficulty, the question regarding the best way to lead is still waiting for answers. It is perhaps useful to look at some literature that attempt to discuss this question.

3.5.2.4. *The best way to lead educational change in schools*

While the literature discusses change-adoption leadership in different ways, there is no agreement on a leadership practice that fits all circumstances. Leadership models provide essential guidelines, but they cannot simply be borrowed from one school and employed in another given that what works in one setting may not work equally well in other contexts (Hallinger, 2011). Various change management theories and models are only for leaders to get a sense of what may work in their schools (Hallinger, 2011). In support of this opinion, Fullan (2001) state that change leadership theories and the supporting research should only be for making sense of the planning and monitoring of a change implementation. Bush and Glover (2003) and Hargreaves and Fink (2012) add further that the selection of leadership approaches depends on the nature of the change, the school milieus, and, more importantly, on the stage of change for which a strategy is employed.

Essentially, there are many behavioural taxonomies of effective school leaders in the educational change-process literature. Yukl (2012) discusses that while some leadership taxonomies cover a wide range of what are believed to be powerful behaviours of change leaders, others include only those reflecting a particular leadership model. Some leadership

taxonomies have only a few broadly defined behaviours, while others include a larger number of narrowly defined behaviour categories. Importantly, there is no consistency in the use of labels that define these leadership practices, which, according to Yukl (2012), is another source of confusion. For example, three sets of behaviours of transformational leadership (setting directions, developing people, redesigning the organization) developed by Leithwood and Jantzi (2006) have been expanded into only four behavioural clusters (task-oriented, relation-oriented, change-oriented, and external-oriented) by Yukl (2012). From this point of view, Hargreaves and Fink (2012) suggests that one should best define the ‘change leadership’ concept by considering various aspects of this intensive task, and that the choice of a leadership strategy should depend on the nature and purpose of the change, the school environment and, more importantly, on the stage of the change process.

Given that these taxonomies of leadership behaviours vary substantially, Hallinger (2011) and Leithwood et al. (2008) emphasise that the effectiveness of change guidance within a school depends on the extent to which SBLs maintain a balance between ‘administrative’ and ‘democratic’ leadership practices. Perhaps, this is why scholars such as Glickman et al. (2018) have combined supervision and leadership of instruction in their literature of school leadership. This understanding is also echoed by Fullan (2001) who discusses that effective change leaders in schools often demonstrate “inclusive and facilitative orientation; efficient management practices; coupled pressure and support; and that they strategically attack incoherence” (p. 142). Strong managerial capacity, according to Fullan (2014), is essential when a school leader employs other approaches to managing teachers’ adoption of change. In view of these, what can help SBLs to adopt appropriate leadership approaches is clearly their knowledge of resistance to change, the triggering factors, and the strategies to manage them.

While theorists agree that managing change in schools is a constant process of thinking and redesigning the approach, there is an increasing trend of recommending that school leaders move away from supervisory and control methods towards collaborative ones (Hallinger, 2011; Hallinger & Huber, 2012; Leithwood et al., 2008). Fullan (2014) maintains that this later approach is a powerful way to lead change, as it consists of amassing and spending on professional capital. Essentially, most researchers of change (e.g., Ho, 2010; MacBeath, 2005; Sagnak, 2016; Somech, 2010; Stosich, 2017) voted against mechanistic strategies of

managing change, showing that the involvement of staff members in the process of making change-related decisions is an efficient way of resolving technical challenges compared with when leaders shoulder the entire change leadership task by themselves. That is to say, much evidence favours the human perspective of guiding change compared with the purely mechanistic approaches. The change leadership in the contemporary world, according to Leithwood and Jantzi (2006), requires school leaders not only to be adept in utilising data to inform instructional practices, but also in cultivating shared leadership practices.

Moving away from control to collaborative leadership is more important because of the teachers' professional powers. According to Ornstein and Hunkins (2004), SBLs need to be extra careful in using power to 'enforce' adoption of educational changes as attempts to influence pedagogical change is limited by teachers' professional autonomy, an issue that plays part in teachers' decisions concerning how and what they do in classrooms. Hallinger (2011) and Fullan (2001) contend that every staff-member must visualise her/himself in the equation of change and realise that the change is largely a joint process between themselves, the change designers, and the change leaders. Empowering teachers to view themselves in the equation of change is very crucial because change users such as teachers do not necessarily resist all change, but they do resist seeing change imposed on them.

3.5.3. Change leadership determinants

The real-world atmosphere is not neat for educational leaders. The political, structural, and social contexts in which school leaders work tend to limit and moderate their leadership actions and events (Goldring et al., 2008). Nevertheless, the level of such limitations varies from school to school. Hallinger and Huber (2012) discuss about the variations of actions carried out by school leaders and how such variation relates to the context of the schools in which they work. Therefore, most scholars (e.g., Fullan, 2001; Hallinger & Huber, 2012) have called for researchers and change developers to pay increased levels of attention to these factors as they cumulatively present significant impacts on the school leadership and, in particular, on leadership for learning in dealing with changes.

The literature informs that SBLs' approaches to guiding change adoption are influenced by their individual capacities (Gilley, Dixon, & Gilley, 2008; Goldring et al., 2008) and by the environments of the schools in which they work (Ball, Maguire, & Braun, 2012; Goldring

et al., 2008; Hallinger, 2011; Lock & Lummis, 2014). The following sections discuss how these aspects affect the leadership of change in schools.

3.5.3.1. *Change leadership capacity*

The role of leadership experience and skills in managing the adoption of change in schools is repeatedly reported in the literature (Gilley et al., 2008; Goldring et al., 2008; Hallinger & Huber, 2012). Leadership capacity involving knowledge and experience is believed to influence the way SBLs manage and guide instructions in schools. When SBLs know what new powerful instructional practices look like, their change leadership turns out to be more productive (Fuss, 2018; Gilley et al., 2008). SBLs who are at different stages in their own leadership growth and those with different levels of competence, according to the research conducted by Fuss (2018), place differing levels of priority on aspects of instructional supervision. Goldring et al. (2008) are of the same opinion, adding that school leaders with the substantial knowledge of the change and instructional leadership experience tend to demonstrate significantly different reactions to teachers' adoption concerns compared with those lacking such qualities. Gilley (2008) summarises the change-management aspects that are directly and/or indirectly affected when change-leaders lack experience in change-leadership, and these are the leader's ability to select and use the best change-monitoring strategies, and to communicate with teachers about innovation. That is to say, long-term school-based leaders demonstrate success in guiding transformation because of the 'know-how' they have gradually developed in working with teachers.

The lack of capacity to lead change in schools is in part influenced by the ways through which school leaders are appointed (Oplatka, 2012). Leadership appointment in schools is largely based on an apprenticeship model (Kuluchumila, 2014; Oplatka, 2004). That is, individuals are appointed to occupy formal leadership positions after having revealed a successful teaching record, and sometimes because of substantial teaching experience (Oplatka, 2012). While this practice is recommended, Kuluchumila (2014) revealed that training offered to beginning school leaders focuses largely on financial management, how to deal with disciplinary issues, and on school planning.

Because SBLs are appointed and developed in this way, Oplatka (2004) and Kuluchumila (2014) report that most of them give more priority to maintenance obligations over those

related to implementation of educational programs. Most leaders in schools investigated by Kuluchumila (2014) in Tanzania, for example, tended to allocate extensive time and efforts for routine maintenance tasks such as managing the school finances, dealing with discipline issues, and scheduling school-daily activities.

It is worth mentioning that this approach to the selection of SBLs and the related problems are mostly reported in developing countries. Bush and Oduro (2006) inform us that the selection of SBLs in many African countries does not conform to any powerful vision. Studies carried out by Onguko, Abdalla, and Webber (2012) and by Kuluchumila (2014) in Tanzania and one conducted by Webber, Mentz, and Scott (2014) in Kenya provide some supporting evidence, revealing that there is no specific specialist training to prepare school principals, and even those who are appointed to lead schools receive little induction and or get minimum support from higher authorities.

3.5.3.2. *School context and climate*

Educational programs and changes are implemented within both challenging and enabling conditions. According to Ball et al. (2012), internal dimensions that influence adoption and leadership of educational changes include: situated context (e.g., location of school and its history); professional cultures (e.g., interactional cultures and policy management); and, material context (e.g., staffing, infrastructure, and buildings). Lawson (2010) point out that while there is a wide range of instructional approaches suitable to inquiry learning, in any particular context, the choice is limited to, among others, class-size and facilities. As such, classroom factors explain more than one-third of the variation in teaching among teachers and schools (Lawson, 2010). That is to say, classroom factors reduce the effectiveness of change leadership in schools. Little (1990) and Fullan (2014) discuss the need of looking at the connectedness and collegial interactions of staff members within schools to understand the norms and beliefs of practice, shared goals, occasions for collaboration, and problems of mutual support when implementing a school program.

Essentially, most academics (e.g., Ball et al., 2012; Fullan, 2001; Whitaker, 1993) agree that in-depth and lasting change require significant alterations of these aspects. Therefore, leaders are required to determine the best ways in which they can deliberately reshape and modify contexts given the fact that these, according to Little (1990), are among the reasons

for implementation failures. For example, while the literature reveals a growing emphasis on collaboration of teachers as one of the significant techniques of fostering the adoption of educational changes, academics, including Little (1990) and Whitaker (1993), identify the perceptions of professional autonomy as the major limitation to this culture in schools. Fullan (2001) notes that this dimension is challenging because of its intangible nature. According to Ball et al. (2012) and Ornstein and Hunkins (2004), perceptions of classroom independence influence faculty members to develop a very little sense of the necessity for interaction with others and collegiality in schools, and these, in turn, influence departments to operate in silos as autonomous units where teachers interact selectively with colleagues (Ball et al., 2012).

While this silo mentality presents no problem as long as the practice conducted under the umbrella of autonomy aligns with what is regarded as ‘good practice’ in schools, Fullan (2014) and Fullan (2001) suggest that it should be discouraged for professional learning to be successful in schools. Given that this individualistic culture paralyses the quality of interaction, it equally blocks leaders’ efforts, according to Fullan (2001), to lead educational changes and, in particular, to transform a school into a learning organisation. Ornstein and Hunkins (2004) note that it is challenging for leaders to nurture collegiality as this process is voluntary considering the professional autonomy bestowed to teachers. Whitaker (1993) extends this argument, suggesting that such an atmosphere makes leaders feel worried about requesting teachers to comply with the change demands or to transform their instructional practices for the fear that their colleagues may interpret requests such as these as attempts to challenge their professional capabilities. Therefore, although change leaders in schools can transform cultures that are harmful to change adoption by employing some powerful strategies (Ball et al., 2012), ‘norms of privacy’ present significant levels of limitations to their change-leadership efforts.

3.5.3.3. *External context*

The external realities are also a source of anxieties for educational leaders (Hallinger & Huber, 2012). For example, the political context of most imposed changes allocates a large part of the authority to the hands of change designers (Fullan, 2001), and more especially when a change is externally mandated by governments (Whitaker, 1993). In this context,

Hallinger and Huber (2012) state that leaders' perceived conflicts between accountability demands and professionalism have adverse impacts on school leaders' approaches both to leadership of change and to school improvement efforts. This problem transpires when the adoption of innovation and school effectiveness are promoted through accountability and standard procedures (Fullan, 2014) because these factors present competing demands for leaders' attention. Hallinger and Huber (2012) further comment that such feelings make leaders feel as if they are dragged simultaneously by different commands in two different directions, which challenges their leadership style or approaches. Lock and Lummis (2014) provide supporting evidence for this argument, where they observed that the accountability pressures took some principals away from the fundamental task of leading teaching in their schools.

3.5.4. Summary

“Successful” school leadership is a concept that covers a broad spectrum. Researchers and theorists agree that the specific demands of change, school leaders' experience and skills, the general situation and specific context of the implementation, and the stages of change collectively interact to influence the change management process as well as to determine its effectiveness. Implicit in the previous discussion is that the task of leading changes in schools requires SBLs who are cognitively capable, dedicated, and who can create an atmosphere that creates meaning and direction for the lives of teachers in dealing with change. Given that very few schools leaders in the world fit this ideal picture (Hallinger & Huber, 2012), change leadership continues to be a phenomenon worth investigating. This is the rationale for, and place of, this study.

3.6. Models for evaluating adoption and management of change

The previous sections have detailed the complexity of change adoption and ways to guide it in schools. The effectiveness of change leadership is also known to be indicated by the level of change adoption. Given that this was one of the purposes of this study, reviewing and selecting a model to study the level of change-adoption was conducted.

Many models for describing, measuring, and then guiding educational changes have been so far developed. These include: Overcoming Resistance to Change Model; Change Agent Model; the Linkage Model; Research Development and Diffusion Model; Problem Solving Model; and, the Concerns-Based Adoption Model (Ornstein & Hunkins, 2004). Each of these models reflects a particular philosophy, “representing a different view and way of thinking about the change process” (Hall & Hord, 2006, p. 39). Therefore, using any of these for research and for managing the implementation should be based on a reasonable rationale. The Concern-Based Adoption Model, as described broadly in the next section, is particularly comprehensive (De Vocht, Laherto, & Parchmann, 2017; Hollingshead, 2009), making it more relevant for studying and understanding the degree of both adoption and management of change in schools. Therefore, this model was selected for this study.

3.6.1. The Concerns-Based Adoption Model

The Concern-Based Adoption Model (CBAM) maintains that people considering and experiencing change evolve differently, at different stages of change and at different rates depending on the questions they ask themselves regarding the meaning and necessity of an innovation, what that innovation demands them to do, and in having “doubts about one’s ability to succeed with the new ways” (Hall & Hord, 2006, p. 151). As such, people tend to resist changes or demonstrate low levels of implementation of changes primarily because they lack answers to their various ‘worries’. Therefore, instead of merely providing people with materials, resources, and training, the CBAM recommends that endeavours to influence potential users to accept an innovation should first start with addressing these worries (Hall & Hord, 2006; Hall & Hord, 2015; Hord, Rutherford, Huling-Austin, & Hall, 1987). Importantly, the CBAM starts from the perspective that change is a ‘process’ and not an event, and each individual’s journey through the change adoption process is unique (Hall, George, & Rutherford, 1977).

The prominent CBAM champions (Hall, George, & Rutherford, 1977; Hall & Hord, 2015; Hall & Loucks, 1978) recommend researchers and change leaders focus on three different but related dimensions of change to understand how users deal with it. These dimensions are the Stages of Concern about the innovation; Levels of Use of the innovation; and, the Innovation Configuration of implementation of aspects of the innovation. Such information

helps to detect issues that change users might be having as they strive to master the change and allows change leaders to plan for relevant interventions.

3.6.1.1. *The Stages of Concerns (SoC)*

The conception of Stages of Concerns draws heavily on the initial longitudinal study conducted by Fuller (1969), which examined the concerns of small groups of prospective teachers about their teaching careers. Fuller found three categories of anxieties that regulated the prospective teachers' motives about teaching. During the first few weeks of training, the prospective teachers' concerns were at a personal level as their thinking was mostly about how the training affected them. Fuller labelled these 'worries' as the period of "self-concerns" (Fuller, 1969, p. 220). During the middle of the training, their attention changed to the demands of the teaching task, and especially how to carry it out. Towards the end of this training, Fuller observed what he referred to as "impact concerns" among the student teachers (Fuller, 1969, p. 216) as they were mostly concerned with their own impacts upon the "learning of the students" they were to teach (Fuller, 1969, p. 216) and the way they could devise more techniques to improve their learning. Having conducted these studies several times, Fuller concluded that "teachers not only have some common concerns, but these concerns occur, for groups at least, in a fairly regular sequence" (Fuller, 1974, p. 112).

Fuller's framework of concerns was further developed during the 1970s by the team of researchers, notably Hall, Rutherford, and Loucks, at the University of Texas at Austin (Hall & Hord, 2015). As these academics attempted to institutionalise a Personalized Teacher Education Program, they observed patterns of concerns similar to those reported by Fuller, which they elaborated much further into seven stages. These seven stages are in the progressive order from early to late Stages of Concern, and they include: Awareness; Information Seeking; Personal Concerns; Management; Consequences; Collaboration with other practitioners; and, Refocussing, which involves critical evaluation of the innovation. In 1974, (Hall et al., 1977) and colleagues developed and validated the concern-measuring instrument, the Stages of Concern Questionnaire (SoCQ), and noted a need to measure two additional constructs for achieving a comprehensive understanding of the change process. These constructs, which are the Levels of Use (LoU) of the innovation and the Innovation

Configuration (IC), help to measure what, how, and the extent to which aspects of change are being used.

3.6.1.2. *Levels of Use (LoU)*

The LoU component deals with the users' behaviours and actions related to the adoption or implementation of the innovation. This component is based on the observation that as users attempt to master the innovation, they exhibit various predictable sets of actions and behaviours (Hall & Hord, 2015). This construct (i.e., the LoU) presents such actions and behaviours into eight discrete levels, describing what and how users behave in dealing with the innovation (Hall & Hord, 2015; Hall & Loucks, 1978), ranging "from the lack of any information that an innovation exists to an active, sophisticated and highly effective use of it, and further to active searching for a superseding innovation" (Hall et al., 1975, p. 52).

To examine an individual user's LoU, Hall and colleagues developed the LoU branching interview approach. The resulting chart is used as a decision-making device as information is gathered through focused interviews (Hall et al., 1975). Nevertheless, for a well-trained researcher, information regarding the LoU could be collected equally well through typical focus group interviews (Hall & Hord, 2015).

3.6.1.3. *Innovation Configuration (IC)*

The IC is based on the fact that rarely do teachers implement any innovation with 100% fidelity or in the same way as their peers. The actual implementation practices vary as every teacher adapts an innovation to her/his context, understanding, and experience (Hall & Hord, 2015). As such, the implementation practices often lie "along a continuum from being very close to what the developer of innovation had in mind to a distant zone where what is being done is nearly unrecognisable" (Hall & Hord, 2006, p. 113). Essentially, this component rejects the issue of fidelity of implementation. Early research noted a need for "describing various adaptations made on change during the actual implementation process" (Hall & Loucks, 1978, p. 4). Thus, the IC map that is generated depicts the extent to which the innovation has been adapted, and whether, or not, such adaptations are at odds with the designer's intention.

To study variations of implementation, Hall and colleagues advise researchers to chart the implementation practice of each individual on the IC-Map, which is a rubric consisting of “descriptions of different ways of undertaking an innovation” (Hall & Hord, 2006, p. 116). The IC-map specifies key innovation components, defining what the ‘use’ refers to in the context of the implementation of the innovation as well as setting a point beyond which adaptations are not acceptable.

Therefore, for an IC to be meaningful, what a quality implementation refers to should be defined in advance. Without this clarity, an attempt to map implementation becomes an impractical endeavour. In view of the fact that innovations are different, no universal IC-map exists. Researchers are required to develop a map that contains the key components for each innovation of interest. Hall and Loucks (1978) provide a manual for designing IC-maps.

3.6.1.4. *Advantages of the CBAM*

Many factors qualify the CBAM to be a useful model to study the change in schools. First, the CBAM is both a descriptive and predictive tool. As a descriptive device, it is useful to both researchers and leaders for illustrating the extent to which change is institutionalised in schools. The CBAM can also be used as a predictive tool to envisage the rate at which the change will unfold. Based on these functions, the CBAM allows not only evaluation of the degree of transition, but also proper planning for intervention strategies to improve the adoption of the change (Hollingshead, 2009). Second, the CBAM allows users and leaders to examine transition at any stage of change (De Vocht et al., 2017). Both assessment and intervention could be conducted both during the initial stages and through the continuation stages. Third, many researchers have used CBAM to investigate change adoption because it is rich in reliable instruments that were not only developed through rigorous studies, but which can also be easily adapted to study any educational change.

Many researchers have adopted the CBAM to investigate the adoption and management of change in schools perhaps because of its eclectic nature described next. Characteristically, this model encompasses many of the conceptions of other change models. For example:

- (i). As it “places primary emphasis on adopters’ collaboration with an external change or resource agency” (Hall et al., 1973, p. 4), the CBAM appears to embrace the philosophy asserted by the Linkage Change Model;
- (ii). Given that the CBAM “addresses fears, misgivings, misapprehensions, and other factors that are likely to inhibit the acceptance of change” (Ornstein & Hunkins, 2004, p. 313), it behaves like the Overcoming Resistance to Change Model; and,
- (iii). Similar to the Problem-solving Model and the Organisational Development Model, the CBAM recognises that learning brings change, change involves solving problems, and that it is essential to support users during the change-transition processes if an innovation is to succeed.

3.7. Summary of the literature review

The literature review has presented information regarding educational change, detailing the personal part of change and role played by school-based leaders (SBLs) in the adoption, implementation, and institutionalisation of educational changes in schools. Theorists of educational change (e.g., Bush & Glover, 2014; Fullan, 2014; Hallinger & Huber, 2012), demonstrate that leaders of successful schools possess four characteristics: they respond flexibly to their circumstances, demonstrate high levels of clarity in their communication, are less interested in control practices, and emphasise the importance of students’ learning. While learning from the leadership of successful SBLs is essential, it is not completely agreed on how such leadership practices combine to form an integrated whole.

Researchers and theorists agree that SBLs’ experience and capacity for change, as well as the school context and culture, constitute variables impacting how they bring about school improvements and instructional changes. This multiplicity of factors has made the change leadership concept to appear not only complex to understand, but also very difficult to generalise to all schools. Therefore, even though change-related theories have continued to flourish, there remains much to be learned concerning how to make any change a success in school-specific contexts. Gaining a wide understanding of practices and experiences of

successful SBLs in many school contexts is essential because it informs the issues related to institutionalisation of change by school leaders. This is where this research is situated.

By reflecting on the purpose of this study and considering the pertinent literature reviewed, the 2-level interactive system framework (Figure 2) was developed not only to summarise the reviewed literature but also to depict the issues of focus in this study. This framework is a hybrid as was adapted from: (i) the interactive system framework of Wandersman et al. (2008) and (ii) the multilevel ecological framework of Durlak and DuPre (2008). These two frameworks have similar features, one of which is the interaction between the Support and Delivery levels in dealing with change, which reflects the fundamentals of this study.

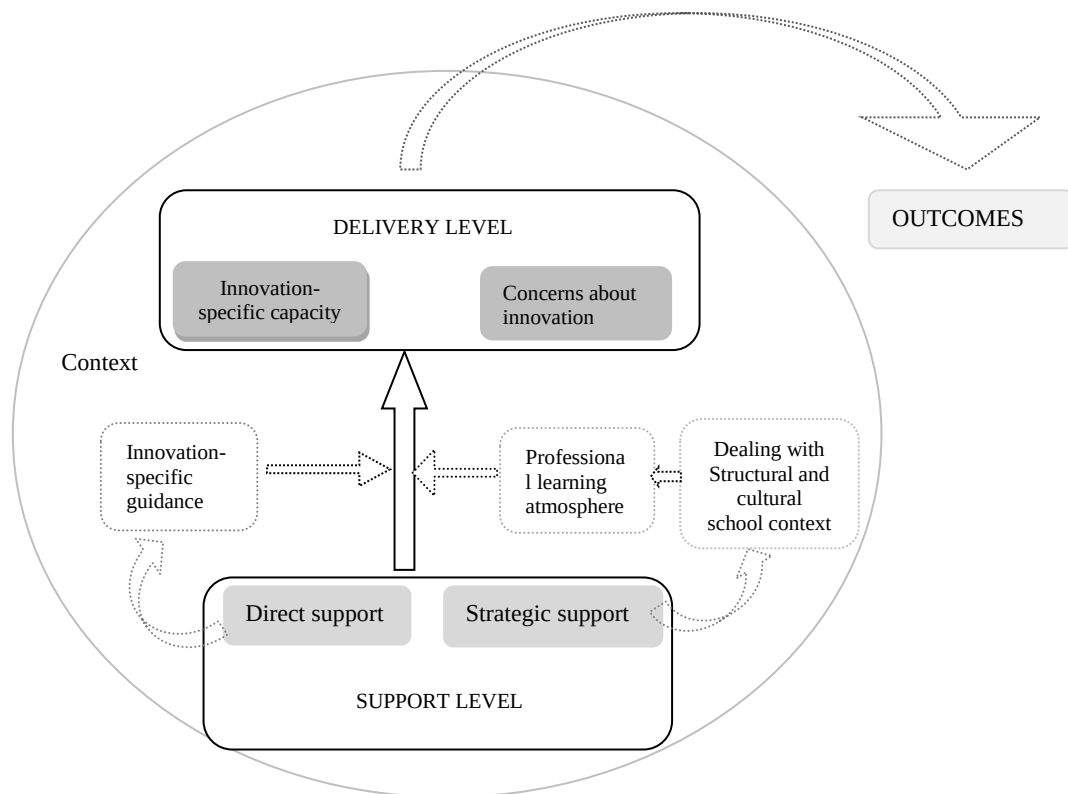


Figure 2. The 2-level interactive system framework.

The Support System refers to the SBLs, who in this study are the change leaders within each school. This system is conceptualised as delivering:

- (i). a direct professional development service, which Wandersman et al. (2008) refer to as innovation-specific support (p. 176), and includes activities such as providing staff with technical information about the innovation and personally guiding them to deal with it.
- (ii). strategic support, which denotes what Leithwood and Jantzi (2006) refer to as “redesigning the organisation” (p. 205). This includes creating an atmosphere that fosters participation in pedagogical decision making within a school and productive peer relationship. Both of these are useful in shaping a culture of learning in schools, thereby improving teachers’ capacity to deal with change.

The Delivery System represents the implementers of change: the teachers. Individuals in this system have varying levels of capacity to deal with change and they demonstrate concerns of varying intensities regarding it. Therefore, the efficiency of this system in dealing with change depends on the leaders’ capacity to recognise the needs of teachers and provide required support using relevant interventions, measures and strategies.

The final dimension in this conceptual framework is the school context. School context includes ‘soft’ aspects (e.g., interaction climate, culture, and vision) and ‘structural’ aspects (e.g., size and structural circumstances). These factors were partially considered in this study given that nuances of local context cumulatively generate considerable differences even with superficially similar schools. As described in the next chapter, the school contexts in this study are explored to set the scene for subsequent analysis of participants’ accounts.

3.8. Conclusion

Various ideas about educational change have been explored to obtain a broader sense of how this issue can be situated and studied in the Tanzanian context. Bearing in mind the fact that the situation (people and their context) is what shapes and determines the reality of change, this review of the educational change literature has provided the necessary analytical framework. The next chapter describes how this study was carried out.

Chapter Four: Methodology

4.1. Introduction

This chapter provides a succinct overview of the research process. It delineates the study approach, design, and other procedures the researcher followed in investigating answers to the research questions. The chapter starts with the description of the chosen research approach and its suitability for this study. The chapter's next section details the design of this study, including criteria that the researcher considered when selecting the case-study schools and participants, the data collection process and techniques, and the procedures he followed in analysing these data. The chapter concludes by detailing the way the research dealt with issues of research quality and ethics.

4.2. Research approach

Research approaches fall into three main categories: quantitative, qualitative, and mixed approaches. The qualitative and quantitative research approaches represent different ends on a continuum. The mixed approach resides somewhere in the middle of this continuum; and therefore, it can integrate features of both approaches. It is the philosophical assumptions upon which each of these approaches are conceived that determines specific research strategies and methods to be employed in carrying out an investigation. Therefore, a researcher's choice of an approach depends on the intent of a planned investigation rather than merely one's interest.

The quantitative approach is deductive. It requires researchers to collect data in the form of numbers and use these to test the validity of theories and hypotheses. The assumption behind this approach is that reality is 'objective' (i.e., positivism) and by using objective and unbiased statistical techniques it is possible to discover and extend this reality (Taylor, Bogdan, & DeVault, 2016). However, any statistical analysis still requires human interpretation and an acknowledgment of the limitations of the reliability of the metrics and the sample of the population engaged.

In contrast, the qualitative approach is inductive and requires researchers to utilise "words as [their] data and analyse them in all sorts of ways" (Braun & Clarke, 2013, p. 3).

Therefore, rather than using data to test preconceived hypotheses or theories, the aim of the qualitative approach to research is to develop concepts, and insights based on the feelings, perceptions, and experiences of human beings. The assumption underlying this approach is that knowledge and context cannot be disentangled from each other. Knowledge, in this sense, is subjective, and it evolves as people interact with their real-world environment (Creswell, 2014; Punch, 2014).

Therefore, qualitative researchers use words as their data and endeavour to understand them in their localities. Given that it recognises the context as a vital determinant of knowledge, the main interest of this research approach is in the meanings, not numbers. As such, contrary to the positivist notion of being able to obtain pure, uncontaminated knowledge, and with all biases removed, qualitative researchers recognise that these biases exist and are part of research processes. Importantly, they incorporate them into their data analysis as a more pluralistic approach (i.e., a post-positivist approach) (Creswell, 2014; Punch, 2014).

The mixed-methods approach is simply a design that employs a mixture of quantitative and qualitative approaches to generate data. Sometimes, it is appropriate to use a quantitative approach to generate numerical data that can be analysed statistically when generalisations may be required. At other times, qualitative methods are necessary to generate meanings or hypotheses that can lead to quantitative approaches to test the veracity of conclusions with a much larger sample that would be uneconomical to investigate with a qualitative design (Braun & Clarke, 2013).

This study intended to examine science teachers' experiences in transitioning from the previous curriculum to the new 2005 Tanzanian ISCS Curriculum, and how these are accounted for by the adoption-guidance provided by School-Based Leaders (SBLs). As such, the study intended to describe stakeholders' behaviours using their views, opinions, and experiences about the way the 2005 Tanzanian ISCS Curriculum is institutionalised in the three case-study schools. On these grounds, considering descriptions of the three research paradigms, a qualitative approach was deemed the most relevant for this study (Creswell, 2014; Punch, 2014).

4.3. Research design

As emphasised previously, this study intended to examine science-teachers' experiences in transitioning to the 2005 Tanzanian ISCS Curriculum, and how these are accounted for by change-related guidance provided by SBLs in different schools. To attain these objectives, the researcher investigated public secondary schools, but which have exhibited consistent differences in their students' academic performance. Therefore, this study is descriptive as well as comparative.

Of the different types of research designs that could fit well with this setup, the embedded multiple case study design was preferred. The decision to use this design was influenced by the criteria set forth by Stake (2006), Cohen, Manion, and Morrison (2011) and Yin (2014). These academics recognise that the embedded case study design is the most useful when the study aims at:

- (i). “predicting”, “tracing” and uncovering “the operational links” (Yin, 2014, p. 10) rather than frequencies of occurrence of the investigated phenomenon;
- (ii). illuminating contemporary events, especially by answering the “why” and “how” related questions (Cohen et al., 2011, p. 289; Yin, 2014, pp. 10-11); and,
- (iii). when the plan is to collect information from more than one unit of analysis in each case, particularly when such units operate at different levels (Yin, 2014).

These criteria match equally well with this study. The researcher investigated the collected information almost simultaneously while typical events in the case-study schools were in the usual progress. The researcher neither interrupted nor manipulated events and settings. Investigation of both leadership of the curriculum adoption and how teachers dealt with this curriculum was carried out in the schools' typical contexts. Furthermore, this study collected information from participants operating at two main levels within each school, viz., the support level and the delivery level. The support level consisted of the SBLs, whereas the delivery level included the science teachers.

In principle, studying multiple cases is analogous to conducting “multiple experiments” on a related topic (Yin, 2014, p. 57). In both cases, the intent is to replicate results. Selection

of many cases enables a researcher to make comparisons and clarify whether an emergent finding is simply idiosyncratic to a single case or is consistently replicated across several cases (Eisenhardt & Graebner, 2007). However, unlike multiple experiments that extrapolate probabilities for making “statistical generalisations”, multiple-case designs aim at attaining “analytic generalisation” (Yin, 2014, p. 21). That is to say, inclusion of more than one case in the same study is aimed to generalise the findings from such cases to a theory and not to a population. These are the grounds upon which this study involved schools that exhibited consistent differences in their students’ academic performance. The purpose was to determine whether or not such differences covaried with change-related processes in each case-study school as this is what is anticipated by change process theorists (Hall & Hord, 2015).

4.4. Selection of cases

Sites for multiple case studies are selected considering their idiosyncrasy and reliability in illuminating and extending the relationship of constructs of interest (Eisenhardt & Graebner, 2007, p. 27). Thus, case selection is determined by the logic of inquiry; that is, it is the intended replication process that determines the type of cases to be selected for the investigation. Each case is “selected so that it leads to ‘lateral’ or ‘theoretical’ replication” (Yin, 2014, p. 57). When lateral replication is intended, one anticipates similar patterns to emerge across all selected cases. In contrast, theoretical replication involves inclusion of cases where the researcher “predicts contrasting results but for anticipatable reasons” (Yin, 2014, p. 57).

This research relied on a theoretical replication approach. Therefore, the researcher picked three case-study schools that demonstrated consistent differences in academic performance level from within one educational region in Tanzania. The chosen schools included a High Performing School (HPS), a Medium Performing School (MPS), and a Lower Performing School (LPS). The researcher selected case-study schools that demonstrated such contrasting characteristics for the study to ascertain not only the level of adoption and related leadership approaches under different conditions, but also to investigate any relationship between them.

Considering the many differences in the way education is run across the world, the researcher noted the lack of a universal scheme of ranking schools academically. As such, the researcher developed the scheme presented in Table 1 and used it to select the schools for the study.

Table 1

Qualifiers Used to Categorise Schools

Rating category	Rating qualifiers
Higher performing school (HPS)	At least 70% of students passed the Final Exam for Lower Secondary School Education in each of the last three academic years
Medium performing school (MPS)	40 - 60% of students passed the Final Exam for Lower Secondary School Education in each of the last three academic years
Lower Performing school (LPS)	Less than 40% of students passed the Final Exam for Lower Secondary School Education in each of the last three academic years

For a school to be selected as a case, it was required to have consistently exhibited the performance tendency listed in Table 1 for each of the past three years. The underlying assumption was that, if a school had performed consistently at a certain level, then such performance was not by chance. Most likely, the performance of these school covaried with the change transition processes that had been occurring in that specific school. The purpose of focusing on ‘polar-type’ cases was, in this regard, as Eisenhardt and Graebner (2007) remark, to see how the change process literature can be informed by “contrasting patterns in the data” (p. 27).

The level of students’ academic success that each of these secondary school attained in the past three years was hypothesised to covary with the extent to which teachers implemented the 2005 Tanzanian ISCS Curriculum. Likewise, the implementation levels were also assumed to covary with the level of adoption guidance provided by SBLs within schools. The basis for these assumptions and the connection of these aspects can be found in the research literature (Hall & Hord, 2015) and related empirical findings (Craig & Kacer, 2000; George, Hall, & Uchiyama, 2000). Nevertheless, the researcher is mindful of the fact

that the relationship between the change adoption leadership, teachers' implementation of change and students' performance is not as direct as it is often assumed to be. There are many context-specific factors that moderate such a relationship. Therefore, these cautions were considered during the investigation.

The researcher also considered the fact that focusing on only one case-study school from each category shown in Table 1 was risky and akin to "putting one's eggs in one basket" (Yin, 2014, p. 64). However, the researcher also recognised the fact that focusing on many case-study schools from each category would make the data collection process, controlling logistics, data analysis, and reporting of findings in the Tanzanian context very expensive. In light of these constraints, the researcher agreed with Yin (2014) in that the number of cases to include in this multiple case study was not very important. Rather, what mattered most was the potential of each selected case to allow the researcher to gain useful insights concerning the issues being investigated.

The information provided by the Basic Educational Statistics of Tanzania (BEST) as well as the National Examination Council of Tanzania (NECTA) guided the selection of the case-study schools. BEST is a database that reports, among others, the performance trend of each subject for each region in Tanzania. Thus, it provides a useful archive for tracing the educational status of each Region in Tanzania. This database was accessed through a website of the Tanzanian Prime Minister's Office Regional Administration and local Government (PMORLG).

NECTA is a department of the Tanzanian Ministry of Education that is responsible for processing National Examinations for the Primary and Secondary School levels. NECTA provides specific information regarding subject-based performance of every student and of every school. Data published online by NECTA provided the researcher with an opportunity to trace and compare the performance of individual schools across several previous years.

Importantly, there are significant differences in the academic performance levels between public and private Tanzanian schools (PMORLG, 2016), which is due to many contextual reasons that influence teaching and learning in each of these domains. The researcher deemed it worthwhile to investigate schools in only public secondary schools, all of which

were in the urban area of the Morogoro Region. It was somewhat tricky to ensure equal consideration of context-specific factors defining these schools. Therefore, the selection process ended up with schools differing in some features. The selected HPS, for example, was a single-sex school while the MPS and LPS were co-education schools. Other contextual differences, which are also important in influencing the change process, are broadly detailed in the next Chapter. The names of these schools are not disclosed, and this is for maintaining the confidentiality of all participants.

4.5. Key participants

The decision concerning the number of research participants was guided by Braun and Clarke (2013) who claim that “qualitative research tends to use smaller samples compared with quantitative research, and there is no rule for sample size in the qualitative inquiry” (p. 55). Braun and Clarke’s (2013) suggestion is supported by many qualitative researchers (e.g., Bazeley, 2013; Cohen et al., 2011; Creswell, 2014), and the common argument is that the number of participants in qualitative research varies and depends on:

- (i). issues the researcher wants to know (i.e., the purpose of the inquiry);
- (ii). factors that will contribute to credibility of the data (i.e., amount and quality of information collected from each participant); and,
- (iii). things that can be done with available resources and time.

Perhaps more importantly, most qualitative researchers involve few participants because the extensive investigation of the life-world experiences participants have had in typical contexts tends to focus more on what Bazeley (2013) refers to as ‘data saturation’, that is, reaching a point where one obtains no new information from the target sources.

In considering these arguments, this study involved six staff members in each case-study school. In each case-study school, these included: four science teachers (2 for Biology and 2 for Chemistry); the Head of Science Department (HoD); the overall teacher-leader; and, the School Principal (SP). In the Tanzanian school-leadership structure, an overall teacher leader is also referred to as a General Academic Master or Mistress (GAM). In this thesis, the term GAM is used.

The researcher decided to include only Biology and Chemistry teachers because of his own background. Over the six years preceding this study, the researcher taught a ‘Science Teaching Methods’ course, a responsibility he carried out because he was trained to teach Biology during his undergraduate teacher education and science instructional design during his Master’s program. On these grounds, the researcher knew the key processes required in teaching these particular science subjects compared with the processes involved in dealing with other science subjects such as Physics or Earth and Environmental Sciences.

Fundamentally, the researcher’s decision to focus on the specified subjects while collecting data is backed up by Cohen et al. (2011), and Yin (2014). These scholars recommend that the valuable meanings that can be captured through qualitative studies are those which reflect the researcher’s ‘conceptual space’. This implies that, what a researcher investigates should not be too far from her/his personal “experience” (Stake, 2006, p. 2) or from her/his “knowledge” (Cohen et al., 2011, p. 296) of the issue s/he investigates.

Moreover, since it is both “interpretative and subjective” (Cohen et al., 2011, p. 291), case studies largely depend on the researchers’ ability to interpret the ‘social happenings’ with which s/he comes across during the investigation process. Therefore, if a researcher lacks a firm grasp of the issues being investigated, s/he might miss “important clues and would not know when a deviation was acceptable or even desirable” (Yin, 2014, p. 76). This implies that the validity of a researchers’ interpretation of scenarios and issues encountered during the investigation increases if s/he has substantial knowledge of those scenarios.

Essentially, decisions to focus on these subjects during the investigation provided the researcher with:

- (i). the best opportunity to collect relevant information;
- (ii). the best opportunity to perform successfully the ‘detective’ role; and,
- (iii). a capacity to achieve reliable and valid interpretations of all encountered occurrences.

Although this study intended to involve Science Teachers, having a certificate to teach science subjects was not by itself a sufficient criterion for participation. Science teachers who were invited were only those who at the time of this study had already attempted to

implement the 2005 Tanzanian ISCS Curriculum for at least the latest three consecutive years. The researcher considered this length of time as reasonable for teachers to have acquired some relevant experience regarding change-related transitions, the focus of this study.

Involving teachers with the suggested experience was influenced by the previous research findings and literature about change adoption. Fuller (1969) and Hall and Hord (2015) have indicated that change adoption progress is predictable. Individuals who have just started to deal with an innovation are likely to show certain types of concerns, especially self-related concerns, low levels of using it, and their level of implementation tends to be low compared with those who have had a longer time in attempting to deal with the innovation (Fuller, 1969; Hall & Hord, 2015). Park (2012), one of those who support this argument, conducted a study and revealed that the degree to which teachers adopt a change varies between those who are slightly more experienced compared with those who are not, with the more experienced ones exhibiting higher levels of adaptation.

Considering this information, the current study opted not to involve inexperienced teachers or the ones who had just started to deal with the 2005 Tanzanian ISCS Curriculum for fear that they could provide less-rich data regarding both adoption and change leadership perspectives in the case-study schools. Therefore, the researcher employed a snowball selection technique to probe the participants' experiences before a science teacher was officially invited to participate in this study. The selection of the potential participants commenced by asking frontline teachers and SBLs in each school to suggest colleagues with the experience desired by the researcher.

As specified previously, other key participants were at the support level. They included the Head of the Science Department (HoD), the General Academic Master/Mistress (GAM), and the School Principal (SP). These participants were interviewed to probe for the leadership they provided to their science teachers in dealing with the implementation of the 2005 Tanzanian ISCS Curriculum. The investigation focused on the kind of instructional-related support that these SBLs provided to science teachers (i.e., the 'what' related aspect of the first research question) and techniques they employed to provide such support (i.e., the 'how' related aspect of the first research question).

4.6. Data collection instruments and techniques

Given that the major mission of any case-study is to seek everyday happenings, researchers are encouraged to collect information that they are personally able to see or hear directly from data sources (Stake, 2006). However, Cohen et al. (2011) contend that there are times when one cannot access the case's life manifestations. In such circumstances, researchers are allowed to capture information through secondary sources (Cohen et al., 2011; Stake, 2006; Yin, 2014). Importantly, Yin (2014) adds that when converging lines of evidence are used to study a case's affairs, findings and final conclusion become more trustworthy, valid and reliable.

In considering these suggestions, this study relied on interviews and questionnaire as the primary data collection strategies. To substantiate evidence collected using these primary strategies, the researcher carried out document analysis and observations. The summary picture concerning these investigation techniques, and the instruments and specific issues for which these instruments were used during the research, is presented in Table 2 on page 75 of this thesis.

4.6.1. Interviews

There are three styles of conducting research interviews: structured, semi-structured, and unstructured. The major difference between them is “the degree of rigidity with regard to their [question] presentation structures” (Berg & Lune, 2012, p. 108). While they all suffer from some common methodological flaws, their distinct characteristics result in pertinent individual strengths.

Unlike unstructured interviews, semi-structured and structured ones allow researchers to control the conversation depth and block interviewees from initiating discussions beyond the researcher's topics of interest. This is based on the fact that their conduct is controlled by a set of questions prepared prior to the actual interview session (Berg & Lune, 2012). Even though structured and semi-structured interviews appear to be similar in the way they are carried out, the purpose for which they are used varies significantly. Structured interviews strictly rely on the same set of questions and are asked in the same order in each interview session. Depending on a situation, semi-structured approaches allow researchers

to ask extra probing questions, re-order the sequence of questions, and to adjust the level of the language used during the interview (Berg & Lune, 2012). Such differences explain why semi-structured interviewers are able to collect more and clearer information than just the quantified set of responses that are collected during structured interviews.

Considering its strength and for the purpose of achieving the objectives of this study, the researcher employed face-to-face semi-structured interviews in collecting information of interest. With the use of semi-structured interviews, two categories of information were collected, namely:

- (i). SBLs' change intervention practices; and,
- (ii). Science teachers' levels of curriculum implementation.

4.6.1.1. *Intended data*

Interviews about SBLs' practices of guiding adoption involved both the science teachers and SBLs. Each of these clusters of participants was interviewed using a different but related set of questions. This arrangement allowed the study to use similar questions to elicit the same information but from participants who worked at two different levels in each case-study school. Schedules for each of these interviews are presented in Appendix 1 and Appendix 2 respectively.

In investigating levels of curriculum adoption, the study interviewed only science teachers using semi-structured interviews (Appendix 3). To generate the related interview schedule, the researcher had to read and reread the 2005 Tanzanian ISCS Curriculum to identify the main implementation components. The complete list of these components is presented in Appendix 4, from which the researcher derived a list of interview questions. Responses from these interviews were backwardly mapped to derive the actual variation in enactment of each of these curriculum components.

The research employed a checklist of components instead of using an Innovation Configuration Map as suggested by Hall and Hord (2015) because the 2005 Tanzanian ISCS Curriculum was released for implementation without any relevant Map. Although Hall and Hord (2015) provided the guideline that researchers should follow to design any

IC-Map, such procedures seemed not to fit with the logistics of this study, especially because:

- (i). this study was not set around action-based methodologies, and
- (ii). the research was conducted under major time and financial constraints.

4.6.1.2. Interview language

In Tanzania, English is the official medium of classroom instruction, and its use is highly recommended within a school. Nevertheless, Kiswahili is the main language that is spoken outside formal school environments. Consequently, Kiswahili has a significant influence upon Tanzanian's English-speaking competence. Research shows that when individuals speak using a language with which they are not well conversant, both their willingness to communicate and openness in their dialogue are all limited (MacIntyre, 1994; Yashima, 2002). Therefore, it was considered prudent to give the participants the freedom to use English and/or Kiswahili during the interviews. All of the participants, except one from the MPS, mixed both Kiswahili and English during interviews. As described in section 4.8.2.2, the interviews were transcribed into English by the researcher, and checks for meaning were provided by a colleague who is fluent in both languages.

4.6.2. Document Reviews

Document review is one of the powerful strategies of qualifying, discounting, and noting countervailing evidence in research (Yin, 2014). Therefore, researchers adopt this strategy to establish construct validity in their studies. On these same grounds, document review was not a standalone data collection technique in this study. Document reviews provided additional evidence and functioned as a way of corroborating data gathered using other strategies.

The researcher used this technique to gain insights regarding instructional activities and approaches used by teachers to deliver the curriculum. Documents were reviewed to detect the extent to which the teaching-related practices reflected the ideals of the 2005 Tanzanian ISCS Curriculum. As the document-review guideline presented in Appendix 5 indicates, adherence to the philosophy of this curriculum was gauged by checking science

teachers' instructional preparation; choice and use of instructional methods; sequencing of instructional activities; learning resources; and, the assessment process. In this way, the researcher had additional information about variations in the way science teachers dealt with the 2005 Tanzanian ISCS Curriculum.

Additionally, reviewing the documents allowed the researcher to uncover any change-related guidance that SBLs provided to their science teachers. While examining documents, the focus was also on pinpointing ways in which SBLs complemented and directed or guided instruction. A list of investigated documents is presented in Table 2, while details of the questions that guided this process are presented in Appendix 6.

4.6.3. Observation

Observation was the third data collection strategy used in this study. There are two main advantages of conducting observations that influenced the researcher to adopt this strategy in this study. First, observing the live events allows a researcher to “identify discrepancy between what the informants say and what they actually do” in practice (Hennink, Hutter, & Bailey, 2011, p. 173). This is based on the fact that there are circumstances where research participants tend to mislead a researcher by exaggerating the reality or disclosing less information (Taylor et al., 2016). Therefore, any opportunity to witness the cases' live events provides a way of authenticating whether, or not, the participant's own words are a true reflection of reality.

Another advantage of the observation approach is its capability to inform context-specific issues that influence the participant's lives, but which cannot be tapped using other data collection strategies. Some of these context-dependent issues include the meaning of speeches, physical facts, and participants' actions (Bazeley, 2013; Hennink et al., 2011; Yin, 2014). Any failure to reveal such peculiar features of the case, which is likely to occur when the observation is not employed (Yin, 2014), leads to an imbalanced interpretation of a case's affairs.

When collecting data, the researcher's observations focused on actions and interactions of both science teachers and SBLs. The specific issues that were observed include:

- (i). the way the SBLs were guiding teachers' implementation of change (i.e., change facilitation actions and events); and,
- (ii). how science teachers were implementing the 2005 Tanzanian ISCS Curriculum in the classroom.

The researcher adopted a 'walkthrough' observation technique. He conducted frequent, focused, and brief visits to observe and investigate the teaching and learning processes. This study preferred walkthroughs because it helped the researcher to reduce any potential 'Hawthorn Effect' during the observation. With the use of this approach, the researcher believes that the technique improved the validity and reliability of information amassed by other means.

To gather sufficient information about teachers' implementation of the 2005 Tanzanian ISCS Curriculum, the researcher ensured he: (i) had enough time to observe each occasion and (ii) conducted many observations until he reached the saturation point as suggested by Cohen et al. (2011). It was possible to conduct observations with no limitations considering that the participants themselves agreed in advance, a strategy recommended by Kachur, Stout, and Edwards (2010). The researcher planned to observe many class sessions. He also planned to spend about 30 minutes on each occasion. Persistence during these processes helped the researcher to investigate critically the extent to which the science teachers employed both student-centred and inquiry approaches in their teaching. By the end of the data collection period, the researcher managed to carry out 26 observations (two independent observations from the four science teachers and three independent observations from the six teachers).

While the focus of the walkthrough is on certain essential questions, it is often advised to change such questions to what Kachur et al.(2010) refer to as "look-fors" (p. 76). 'Look-fors' refer to clear statements of what the researcher expects to observe in the field. These include things such as specific instructional strategies, learning activities, daily routines and artefacts. In consideration of this suggestion, the researcher used the checklist of components described previously (presented in Appendix 4) to map teachers' configuration of implementation. The researcher developed this checklist after having read the 2005 Tanzanian ISCS Curriculum in an iterative style. However, the researcher did not prepare

any specific observation schedule for ‘adoption leadership practices’. He observed every action and event that seemed to relate to adoption guidance. The only exception was when participants asked the researcher not to observe, and this occurred twice in the MPS.

The observed information was recorded in the form of journal notes. These notes consisted of short sentences and terms that briefly embodied what the researcher observed on each occasion. He enriched his observation notes with contextual information and identifying features (date, time, and a place where an action occurred), and his personal reflections but without inferring any meanings. This process helped him to relive the observational data during the analysis, a stage at which he described the relationship between the participants’ behaviour he observed and their physical or socio-cultural environment.

4.6.4. Questionnaire

This study employed the Stages of Concern Questionnaire (SoCQ). As discussed earlier in section 3.6.1.1 in Chapter 3, the SoCQ is well known to change process researchers as the best instrument to study users’ concerns as they continue to deal with an innovation. In this study, the SoCQ was used to investigate science teachers’ perceptions and worries about the 2005 Tanzanian ISCS curriculum. This instrument (Appendix 7) was adapted from the original 35 items 7-point Likert scaled SoCQ (Hall & Hord, 2015, pp. 310 - 312) to fit with the context of this study. The details of such modifications are presented below.

As indicated previously, participants of this study speak both Kiswahili and English, but Kiswahili is their first language. To fit with this situation, the original items of the SoCQ were not only adapted to reflect the 2005 Tanzanian ISCS Curriculum, but also to consider the respondent’s language. Therefore, part of this process was the translation of the original SoCQ from English into Kiswahili. In this way, each respondent was free to score a SoCQ written in her/his dominant language.

During the translation, the researcher ensured that the Kiswahili SoCQ contained words and sentences that presented the exact meanings of the English SoCQ, the original version. Therefore, the researcher’s attention was on the issues of linguistic equivalence, face, and content validity of the Kiswahili SoCQ (Elizabeth, 2007). To succeed in this mission, the researcher adopted a ‘forward and back’ translation tactic (Beaton, Bombardier, Guillemin,

& Ferraz, 2000; Elizabeth, 2007; Teich, 2012). At first, he translated the original SoCQ to Kiswahili by himself. Then, the researcher consulted a colleague who is fluent in both of these languages to translate the researcher's translation of the SoCQ back into English. After these processes, the original SoCQ and the back-translated versions were compared to gauge the level of 'discrepancy' between them. The researcher, in collaboration with the consulted colleague, dealt with all noted discrepancies until they were satisfied with the Kiswahili-version of the SoCQ.

Table 2
Data Collection Instrument and Strategies

Guiding question	Indicators for answering the question	Data collection process		Targeted source of data/key informants
		instrument	Technique	
What are the science teachers' feelings, perception and their experience about the new curriculum?	The level of science teachers' concerns regarding the implementation of the 2005 Tanzanian ISCS Curriculum.	Stage of concern questionnaire (SoCQ)		Science teachers (implementers of the curriculum)
	The degree to which science teachers' instructional practice reflects the 2005 curriculum design.	The interview guiding checklist	Face-to-face semi-structured interviews	Science teachers (The implementers of the curriculum).
		Observation checklist	Observing pre-teaching preparations and in-class activities	
		Document checklist	Document review	Teacher's own teaching portfolios – written lesson plans and copies of assignments given to students
How do SBLs ensure that the day-to-day classroom instructions are conducted according to the demands of the 2005 Tanzanian ISCS Curriculum?	Actions and events related to the change-adoption guidance provided to science teachers by the SBLs: (what, how, when, why, how long, how many times).	The interview guide	Face-to-face semi-structured interviews.	Both the Science teachers and the school-based instructional leaders (SBLs).
		Document checklist	Document review	Inspection-based feedback and comments found in the teachers' lesson preparation/delivery documents, Curriculum-related memos and letters from SBLs to the science teachers. Agenda-outlines, meetings minutes, memos-school communication. Informal congratulations or formal reprimands.
		Observation checklist	Observation	Interaction between science teachers and SBLs.

4.7. Data collection procedures

This section details the procedures the researcher followed in collecting information that helped to answer the research questions.

4.7.1. Entering the field

Before starting the data collection process, the researcher sought permission from various executives who are responsible for authorising the conduct of research in Tanzania. At first, research authorisation was requested from the Regional Administrative Secretary. Permission to proceed with the research was granted (see Appendix 8). Subsequently, the researcher contacted School Principals of the three selected case-study schools, informed them about the study and requested to allow their schools to participate (Appendix 9), and schools that agreed to participate this study had to sign the consent form (Appendix 10). After school consent was given, the researcher selected participants, and this followed the procedures detailed previously in Sections 4.4 and 4.5. Using letters presented in Appendix 11 and 13, the researcher communicated and informed the participants about the details of this study and invited them to participate. Thereafter, the researcher sought the consent of each of the agreed participants (Appendix 12 and 14).

Each participant was informed about the purpose of the study, but this did not include key details of the research questions to reduce participants' self-consciousness and any perceived threat about the research, which could have influenced them to behave in dishonest ways. Taylor et al. (2016) state that it is difficult to gain the full trust of the participants, and "when informants know too much about the study details, they tend to hide things from the observer or to stage events for their own benefit" (p. 75).

4.7.2. Building rapport

After participants agreed to participate in this research, the researcher started to build rapport with them before commencing the actual data collection processes. The researcher allocated one month for this process alone. Building significant levels of rapport helped the researcher, as Cohen et al. (2011) point out, to:

- (i). nurture trust between himself and the participants;

- (ii). minimise the risks of interrupting the daily social lives of the participants, a situation that if it was not controlled, could have manipulated the situation in undesirable ways; and,
- (iii). lower the attrition rates amongst the participants.

As will be explained in the later sections, consideration of all these issues helped the researcher to improve the validity of the collected information.

It is worth mentioning that spending one month for building rapport with participants was influenced by the advice presented by Taylor et al. (2016), Cohen et al. (2011) and (Yin, 2014). These academics emphasise that nurturing the relationship between the researcher and the participants is not achieved on a once-and-for-all basis. Rather, it develops over time. As such, establishing friendliness with the participants “allows for building not only a less structured but also a more prolonged relationship between a researcher and [study] participants” (Yin, 2014, pp. 96-97).

4.7.3. Data collection sequence

The type of information, data collection phases, and the amount of time spent on each phase is shown in Table 3. The first phase was for collecting data about science teachers’ concerns in dealing with the 2005 Tanzanian ISCS Curriculum. The researcher distributed the SoCQ and requested participants to rate the extent to which they agreed or disagreed with the 35 items on the 7-point Likert scaled SoCQ that related to this curriculum. The researcher collected the SoCQ a few days later from the participants.

During the second phase, the study collected data about the teachers’ levels of enactment of the 2005 Tanzanian ISCS Curriculum, viz., their Levels of Use. Even though such data were collected using three techniques, the researcher started with the interviews. At first, each participant was interviewed face-to-face individually at sites s/he preferred. After the researcher finished these interviews, he started observations of instruction and document reviews. It is worth reporting that observation of teachers’ lesson presentation was carried out throughout the entire investigation period. The number of observations conducted is as reported in Section 4.6.3.

The last phase was devoted to collecting information about SBLs' leadership of adoption and implementation of the 2005 Tanzanian ISCS Curriculum in each school. Collection of such data started with interviewing the science teachers and finished with the SBLs. The researcher asked each participant teacher to describe the way SBLs supported her/him in transitioning her/his instruction from the previous approaches to the ones recommended by the 2005 Tanzanian ISCS Curriculum. Thereafter, the researcher interviewed the SBLs on the same issues. That is, the researcher asked the SBLs to describe their change guidance practices. The data collection process finally ended with the review of documents.

Table 3
Data Collection Sequence

	Round 0	1 st round (Three weeks)			2 nd round (Six weeks)			3 rd round (Six weeks)		
	All case schools	1 st case	2 nd case	3 rd case	1 st case	2 nd case	3 rd case	1 st case	2 nd case	3 rd case
	4 weeks	1 week per each case			2 weeks per each case			2 weeks per each case		
Data Type 1	Regular visits to all case-study schools for the purpose of building rapport	Teachers' concerns about the new curriculum								
Data Type 2					Teachers' experiences in the implementation of the new curriculum					
Data Type 3								SBLs' change facilitation practice		

The researcher's decision to start with interviewing the science teachers and finalise with the document review was for a good reason. When a researcher plans data collection steps, the best sources of evidence that s/he has to start working with are those that could provide a lead to subsequent sources of evidence (Cohen et al., 2011). Yin (2014) and Cohen et al (2011) are of the view that such an arrangement helps to initiate access to corroboratory or contrary sources of evidence.

However, this data collection sequence was flexible. The researcher changed it whenever a need to do so occurred during the data collection process. For example, after the researcher finished reviewing the documents, whenever he required more clarification from the

participants, he always contacted them again. Therefore, some participants were contacted a few times for follow-up clarification.

4.8. Data analysis

This section details how the researcher managed the collected data and the approach and procedures he employed in analysing them.

4.8.1. Organisation and management of the dataset

The collected information was prepared and organised for analysis. The researcher created three folders for keeping them (one folder for one case-study school). To ensure anonymity and confidentiality of the case-study schools and of the research participants, the researcher:

- (i). carefully removed everything that seemed to endanger confidentiality of the informants and/or of their context; and,
- (ii). assigned each set of the collected data with a unique code-label or pseudonym.

4.8.2. Analysis of qualitative data

To analyse qualitative data, the researcher started with the transcription and translation of the interview recordings. These transcriptions/translations were then coded and categorised these into themes. The following subsections provide details of these processes.

4.8.2.1. *Transcription of interviews*

The researcher listened attentively to each audio recording iteratively and then transcribed them into verbatim textual copies. During the process, he often sought clarification from the respective participants and then added these elucidations to the participant's data item for the things that seemed unclear to him.

To ensure accuracy, and since he was best placed to understand the content and context of the transcription, the researcher handled the transcription process by himself. This decision was primarily based on the fear that somebody else could produce transcripts that lacked a participant's words or with words arranged in a way not intended by a participant. These

issues would have affected the researcher's understanding of what was originally spoken by the participants and his interpretation of their statements. Indeed, handling a large part of the data preparation processes helped the researcher both to recall and re-live the conversations that he had had with the participants (Bazeley, 2013; Corbin & Strauss, 2015; Taylor et al., 2016) and to deepen his understanding of the nuances that emanated from the participants' oral discourse.

4.8.2.2. *Translation of interviews*

Since most interviews were in Kiswahili, the researcher had first to translate transcripts into English. The researcher knew that the language translation process requires a high level of accuracy, especially in selecting words that embody the interviewee's intended meaning as well as structuring sentences in ways that would ultimately present the message intended by interviewees (Davidson, 2009). Given that the research was carried out in Tanzania while a large part of the data preparation was carried out in Western Australia, it became difficult to consult the participants to crosscheck the translation. Therefore, the translation process presented a complex and challenging situation to the researcher.

To avoid making substantial errors, the researcher invited an independent friend who was from a non-education background and fluent in both English and Kiswahili to double-check translations. Avoiding a colleague with an education background ensured that the comparison translation was not influenced by the goals of this study. The researcher and his colleague translated each Kiswahili-verbatim transcript into English transcripts. When the researcher's translation and that of the colleagues varied significantly in choice and order of words or sense of the entire sentence, they discussed the meanings. This discussion led to corrections until the transcripts largely represented the worldviews of the participants. Throughout this process, the researcher was careful to ensure translations generated word-for-word and sense-for-sense agreements.

4.8.2.3. *Familiarisation with data*

Familiarisation with the data began from the first day the researcher entered the field. After each data collection session, the researcher tried his best to understand every data item. He

listened to each audio-recorded conversation immediately after each interview session. When something seemed to be unclear to the researcher, or when he missed some information due to recording problems, he contacted the participants either for more details or clarification.

The researcher aimed to obtain a deep sense of the data, and to get acquainted with the scope and content of the entire dataset. The researcher checked and re-checked the entire data sources again but focusing on one data source at a time. The researcher started with the interview data, followed by data found in documents, and finished by dealing with the observation-data. In this way, the researcher assured himself enough time to reflect on one data item before dealing with another one. By scheduling activities in this way, it allowed the researcher himself, as Bazeley (2013) states, enough avenues “to build a contextualised and holistic understanding of people, events, and ideas being investigated, and the connection within and between them” (p. 101).

The researcher’s process of familiarising himself with the data was informed by Bazeley (2013) and Hennink et al. (2011). At first, the researcher read data items rapidly because he just intended to gauge the superficial clarity of the data. After he completed this skimming, the researcher started to read slowly, more actively and by paying more attention to, and thinking about, issues that emerged from the data (Bazeley, 2013). At this stage, he also started to document ideas and questions, the “floating thoughts” as Hennink et al. (2011, p. 45) describe them, that arose along the way. The researcher used a large part these at the later stages to enrich codes and themes. Following this process, the researcher managed to make sense of the main issues. This process paved the way for data coding, a process that is subsequently detailed.

4.8.2.4. *Data coding*

The data coding process of all qualitative data did not abide by one method. Rather, the researcher allowed an interplay of techniques. This decision was based on the suggestion provided by four sets of literature: Creswell (2014), Hennink et al. (2011) and Bazeley (2013), and Corbin and Strauss (2015). These scholars argue that, if a large part of the data analysis relies on one coding style (method or approach), a researcher is likely to fail to capture some of the significant issues raised by the study participants. Nonetheless, the

researcher was aware that each coding approach (inductive and deductive) seeks to attain a different purpose (Bazeley, 2013, p. 147). Therefore, there was a variation in the way each data source was mainly coded. Table 4 presents the specific coding techniques used during the analysis of each data source. The reasons for using these coding processes are also provided in the same table.

To achieve the best results, the researcher combined the use of both manual and electronic coding processes. The computer program NVivo-11 enabled the researcher, as (Bazeley, 2013) states, to search for large quantities of data both quickly and easily within and across data sources. The researcher decided to use manual coding because he was aware that the software could not automatically relate the theme to other ideas within and across cases (Bazeley, 2013; Hennink et al., 2011). Therefore, the use of both the manual method and the computer program in analysing data helped the researcher to reduce the shortcomings of each of these strategies while attaining the benefits of each of them.

The researcher launched the NVivo-11 project into which he imported interview transcripts and started creating free nodes. These nodes were referred to as 'free' because they were not created in any hierarchical order. This permitted the researcher to explore the entire interview dataset more freely.

In the course of coding, the researcher reread each data item again. At this stage, however, the analysis was much slower than during the earlier stages, and the researcher's attention was more to multiple levels of meaning and connections. While reading each data-item, he highlighted texts that appeared to be not only of interest to himself but also relevant to this study. Each useful issue was imported into the respective nodes using the drag-and-drop approach. For those that were manually coded, the researcher coloured them and wrote the related code at the page margins.

While reading each data item word-by-word, the researcher derived codes in two ways. The first approach involved highlighting specific words that seemed to reflect what the literature says regarding change process management (i.e., deductive coding). Here, the researcher possessed the assumptions that his understanding of the data and how he identified themes were all informed by the previous literature regarding change process. The second way he derived codes was through sense-making (i.e., inductive coding)

(Corbin & Straus, 2015). At this time, more than one sentence, and sometimes the whole paragraph, was used to generate a sense of meaning of the data. The researcher opted for this approach only when he came across with a section or paragraph that seemed to talk about issues, but not in any direct way. To allow new insights to emerge from the data itself, the researcher immersed himself in the data descriptions while being “open-minded and context-sensitive” Bazeley (2013, p. 132). At this time, the researcher was driven by the assumptions that:

- (i). he knew very little about the investigated phenomenon; and,
- (ii). the data contained issues that had not been accounted for by the existing theories or literature about change-adoption leadership.

From this process, the researcher managed to index systematically the entire data set into manageable categories of issues.

Table 4
Coding Types Used for Different Data Sources

Type of data	Inductive codes	Deductive codes	Reason
Interview data	√	√	Interview data is recorded in a language that has both direct (open) and indirect (hidden) meanings to a researcher. Mere pairing a passage or text from these data sets with the codes informed by the previous literature can easily identify some issues raised by the informants. Yet, some informants' words need hermeneutic (i.e., thematic analysis) procedures to uncover the meaning intended by the informants.
Document analyses		√	Data retrieved from documents often consists of short and direct sentences. Therefore, such information is easily coded using a deductive coding approach (Hennink et al., 2011).
Observation data	√	√	Largely, observation data consisted of direct quotes and brief descriptions of observed key actions and or events. Deductive coding is, therefore, preferred during the analysis. As reported in Section 4.6.3, the researcher sometimes enriched the data with his reflection of what he observed but without inferring any meaning. Inductive codes, therefore, were sometimes used during the analysis.

4.8.2.5. *Categorisation and Theming*

Developing themes from the data concerned with adoption leadership was conducted slightly differently from how themes for the curriculum implementation were developed.

After the researcher had finished coding data concerned with adoption leadership practices, he categorised them into meaningful themes. The researcher's primary focus at this stage was on searching for the commonalities and recurrences of codes within the data.

However, the researcher was aware that the strength of a theme is not determined solely by how many times it emerges in the dataset. Rather, it is also based on its potential to capture important aspects in relation to implementation and leadership of the 2005 Tanzanian ISCS Curriculum (Bazeley, 2013). Therefore, the researcher valued even ideas that emerged only once in the dataset.

Before developing themes about curriculum implementation, the researcher identified key components of the 2005 Tanzanian ISCS Curriculum (see Appendix 4). Codes representing specific behaviours were then allocated to the components (themes) they were related. This process resulted in a comprehensive list of themes, which helped the researcher to depict operational variations, but without any fidelity margins being defined.

As there were no fidelity lines to demarcate acceptable from unacceptable practices, the analysis was not conducted as it is normally done with an IC-Map. That is to say, the final analysis focused on:

- (i). whether, or not, a teacher dealt with a component; and,
- (ii). the range of constructivist practices that each science teacher used to deal with the component.

The information about these aspects was analysed with assumption that the fewer the inquiry and student-centred practices are exhibited on each component, the lower the extent of implementation of the 2005 Tanzanian ISCS Curriculum.

4.8.3. Analysis of SoCQ data

The analysis of the Stages of Concern data in this study was performed using the “Stage of Concern Quick Scoring Device” provided by Hall and Hord (2015, pp. 313-314). This is the main way of analysing the SoCQ data recommend by the proponents of this instrument.

Raw scores for the 35 items were first grouped into the seven Stages of Concern scales. Table 5 shows these stages and typical statements for each stage. The individual item scores for a particular concern were then added together to produce a scale score, which was then used to determine a relative score of importance 0% - 100%. The relative percentage scores for each scale were then graphed to produce a Concern’s Profile for each individual respondent.

Table 5
Stages of Concern and Typical Items

Stage of Concern	Typical statement
0: Unconcerned	“I think I heard something about it, but I'm too busy right now with other priorities to be concerned about it.”
1: Informational	“This seems interesting, and I would like to know more about it.”
2: Personal	“I'm concerned about the changes I'll need to make in my routines.”
3: Management	“I'm concerned about how much time it takes to get ready to teach with this new approach.”
4: Consequence	“How will this new approach affect my students?”
5: Collaboration	“I'm looking forward to sharing some ideas about it with other teachers.”
6: Refocusing	“I have some ideas about something that would work even better.”

To allow the researcher to depict the Case-School’s Profile, the concern profiles of all individuals in that case-study school were displayed concurrently on one figure. This plan allowed the researcher to compare similarities in the shapes of participant’s graph (defined by the peaks and valleys). By tallying how many individuals had their peak scores at each Stage of Concern, the researcher was able to make conclusions about the situations in the Science Department in each case-study school.

The researcher did not adopt the style of averaging the participants' concern scores at each stage as this style leads to loss of information. According to Hall and Hord (2015), extreme scores tend to influence the results when an averaging of concern scores is conducted. Therefore, the researcher was concerned that this would end up obscuring the reality in the Science Departments in each of the three-case-study schools.

4.9. Quality control

The quality and/or rigor of the qualitative study is determined by three main criteria: trustworthiness; dependability; and, transferability (Cohen et al., 2011). Trustworthiness demonstrates the extent to which the study findings do reflect reality, and is determined by the degree of honesty and sincerity in the way the participants describe their experiences and the contexts in which they live (Taylor et al., 2016). Dependability, on the other hand, refers to the consistency between the report provided by the researcher and data collected in the field (Cohen et al., 2011). Unlike the first construct, dependability is determined by the way the collected data is interpreted by the researcher. Cohen et al. (2011) refer to this construct as “interpretive validity” (p. 181), and they imply that it is the researcher's ability to interpret the true meaning of the informant's words. The last construct, transferability, refers to the extent to which the study findings can be applied in other similar contexts, situations or to a theory that prompted the conduct of the study, but not to the whole population as is the case within the positivist paradigm. It is for this reason that Yin (2014) defines transferability as “analytic generalisability” (p. 21). In this study, quality and rigor were safeguarded using the strategies described in the following two sub-sections.

4.9.1. During the data collection process

Triangulation was the first strategy the researcher employed to ensure that rigorous and credible data were collected. This strategy is suggested by academics such as Taylor et al. (2016) and Cohen et al. (2011). As indicated previously, this study employed interviews, document reviews, and observation to capture different dimensions of the investigated aspects. With the use of these ‘converging lines of evidence’ (Yin, 2014), the researcher believes that he managed to cross-validate the collected data and reach as close to the ‘truth’ of the issues as possible.

The second strategy employed by the researcher to maximise the trustworthiness of the collected data involved the stimulation of honesty of each participant. Among other things, participant's openness and honesty of the information s/he provide is influenced by her/his perception of the researcher and the goals of the study in which s/he is involved (Taylor et al., 2016). A participant can remain open and frank only after s/he detects an honest relationship with the researcher (Taylor et al., 2016).

This study employed two interrelated approaches to stimulate the participants to talk very honestly about themselves and the context in which they lived and worked. First, all of the invited informants were free to decide to participate in this project or not. This ensured that the study involved participants who not only were willing to participate but also those who were able to disclose the needed information genuinely. Second, the researcher guaranteed participants the safety and confidentiality of the information they provided. Through these approaches, the researcher believes that he largely succeeded to put informants at ease and influenced the majority of them to remain honest and cooperative across the whole study period.

4.9.2. During the data analysis process

In the course of analysing the data, the quality was ascertained by adhering to the practice Cohen et al. (2011) call 'member checking' or 'member validation' as referred to by many academics (Bazeley, 2013; Hennink et al., 2011; Taylor et al., 2016). Given the fact that it was difficult to involve participants in validating the integrity of their transcripts, then the researcher consulted a colleague to help and crosscheck the transcription of interviews. In so doing, the researcher believes that most errors were corrected. However, the researcher agrees that he could not add further information or audit the adequacy of the transcriptions because he could not communicate with the study participants who were in Tanzania while he analysed the data in Western Australia.

4.10. Ethical consideration

The researcher was aware that informants needed to be protected from harms and any infringement of their freedoms as a result of their participation in this study.

Fundamentally, this study was conducted in accordance with the Edith Cowan University's

(ECU) Human Research Ethics Committee, and the steps that were taken to comply with these ethics are described in Section 4.7 of this Chapter and are re-emphasised in this section.

After ethical approval from the ECU Human Rights Ethics Committee and prior to the data collection process, the researcher sought informed consent from each prospective case-study school and then from each prospective participant who were each advised about the research objectives, possible risks of this study to them, and how the researcher planned to minimise such risks. Initially, the consent of each participant was sought orally before each of them was requested to sign a Consent Form described previous in section 4.7.1 in this chapter. These forms guaranteed protection of their welfare and the confidentiality of the information they provided.

In this study, each participant was free to enter, to continue or to exit from the study at any point that they wished to do so. It is for this reason that some participants, as reported in the next chapter, left the study. The researcher considered the fact that good participants are those who are not only knowledgeable of the issues being investigated, but also those who, as suggested by (Cohen et al., 2011), had time and were willing to participate in this study. Furthermore, all of the data, including those recorded on the password-protected devices, were stored in lockable cabinets located at the ECU. Protecting participants' confidentiality and their privacy was further considered in the reporting of the results. The researcher abstained from disclosing the identity of the participants and their schools, and, in addition, from providing any clue that could make them traceable to an informed reader in Tanzania. Therefore, because of these measures, all the information is reported in a strictly anonymous fashion using pseudonyms for individuals.

4.11. Chapter summary

This chapter presented the design and methodology used to carry out this study. First, the decision to use the qualitative approach and adoption of the Type IV case-study design was argued. Second, the Chapter presented the procedures and methods used in the data collection and analysis processes and how the quality and rigor of the findings were ascertained. Finally, the Chapter detailed the ethical protocols adopted. In the next chapter, the study findings are presented.

Chapter Five: The study findings

5.1. Introduction

This Chapter presents the findings of this investigation in four (4) main sections. The first three sections present findings for each case-study school about both the implementation of the 2005 Tanzanian ISCS Curriculum and how SBLs guided it. Findings reported in each case-study school correspond to the first two study questions listed below. The fourth section presents the findings of the cross-case analysis. The cross-case analysis comparison and aggregation of results partly answers the third question.

The three main questions about which findings are reported in these sections included:

- (i). How are School-Based Leaders (SBLs) guiding the science teachers' adoption and implementation of the 2005 Tanzanian ISCS Curriculum?
- (ii). How are science teachers dealing with the 2005 Tanzanian ISCS Curriculum and what are their main concerns about it?
- (iii). In what ways does the change facilitation provided in different secondary schools account for the ways in which, and variation in the way, if any, the 2005 Tanzanian ISCS Curriculum is perceived and implemented by science teachers in Tanzanian secondary schools?

Given that the attention to the context is one of the most identified defining characteristics of qualitative studies, this report of the findings for each case-study school starts with their description.

It is also important to mention that a large part of the description of themes in this thesis is accompanied by vignettes selected from participants' own accounts. As informed earlier on page XV, these vignettes are presented in *italics*. For the longer excerpts, the Kiswahili verbatim transcriptions are presented first, followed by the English-translation placed in boxes immediately after. Styling vignettes in this way helped not only to emphasise, but also to show respect of, and preserve, the authentic first-language voice and the associated cultural inferences of the participants.

5.2. Case-study school 1: The Lower Performing School (LPS)

This section details the findings obtained in the Lower Performing Case-Study School (LPS). The presentation starts with the contextual information, including its: historical background; general setting and location; current school population; and infrastructure. Information about teachers' experience in the teaching profession is also provided. Findings regarding the transition leadership in this case-school is then presented. This section concludes with information concerning science teachers' levels of curriculum uptake, which portrays the effectiveness of the change institutionalisation attempts of SBLs in this case-study school.

5.2.1. Background information of the LPS

The LPS is located a few kilometres from the town-centre, where the Regional Education Office is also located. The LPS is a typical Tanzanian community-based secondary school built by the Tanzanian government in partnership with the local community. Like many other community-based secondary schools in Tanzania, the LPS:

- (i). admits both girls and boys;
- (ii). provides junior secondary education alone; and,
- (iii). it is a day school (i.e., it is not a boarding school).

5.2.1.1. *Population and infrastructures*

At the time of this study, the school had 520 students. There were 60 teachers, of which only 12 were teaching science subjects and Mathematics (three for chemistry, four for Biology, one for Physics, and four for Mathematics).

This case-study school had very few classrooms. Nevertheless, it had three separate laboratories: one for Chemistry, one for Biology, and the last one for Physics subject. Additionally, the LPS had one small library. The three laboratories were small and were not well furnished. Therefore, storage of apparatus and reagents was problematic. During the data collection, some laboratory apparatus and reagent bottles were seen on the bench tops or even stored in boxes.

Because of having so few buildings, classrooms in this LPS accommodated more than 70 students at a time. Students conducted experiments during laboratory sessions. This, however, did not solve the problem of doing enough practical works as students were still overcrowded in these ill-resourced laboratories. Figure 1 illustrates the situation well.



Figure 3. A typical classroom in the LPS.

(Photograph taken by the researcher in October 2017)

All of the 60 teachers, except the School Principal, were allocated to only two office rooms. One of these offices was occupied by teachers who seemed junior to those in the other office. Perhaps more importantly, the distance between these two offices was considerable, with two classrooms and a library between them. It appeared important to record this distance considering its possible impacts on the interaction between teachers in these two offices and how this influence sharing of experiences in curriculum change and the transition process.

In relation to the observations reported above, teachers did not occupy offices according to their teaching subjects. Likely, this further limited any sharing of experiences among same-

subject teachers. More importantly, one could argue that the office of the GAM was not in a strategic position. Her office was adjacent to that of senior teachers; and as such, it was accessed by a door inside this room. This layout possibly created opportunities for senior teachers to have easier access of the GAM compared to the junior teachers whose office was in the separate building some distance away.

5.2.1.2. Study participants

Seven key informants (the School Principal, the GAM, the Head of Science Department, and 4 Science-Teachers) were invited to participate in this study. Two invitees withdrew before the end of the study. These were the School Principal who showed no interest at all in the study, and one Chemistry teacher who withdrew in the middle of the study after he was permitted to enrol at a university to advance his teaching career. This teacher, however, did provide a completed SoC questionnaire, and attended the interview covering his curriculum implementation practice.

To secure participants' confidentiality, they were ascribed pseudonyms, all starting with letter "C" as shown in Table 6.

Table 6
Participants and their Pseudonyms

S/No	Participant	Pseudonym
1	The General Academic Mistress (GAM)	Christina
2	The Head of the Science Department (HoD)	Calvin
3	Biology Teacher 1	Chesco
4	Biology Teacher2	Chaula
5	Chemistry Teacher 1	Chacha
6	Chemistry Teacher 2	Chiku

Christina, the GAM, was a Geography Teacher who had approximately nine years of teaching experience at the time of this study. She started working in this case-study school in 2008, immediately after she had just acquired her Teaching Certificate from one of the Teacher-Education Colleges in Tanzania. In 2011, Christina enrolled in a University Teacher Education course and graduated in 2014, the year which she was appointed to start

serving in the GAM administrative position. Christina, therefore, lacked substantial experience in both teaching and leadership.

Calvin, the HoD and a Chemistry teacher, was junior in teaching compared with the GAM. At the time of this study, he had a teaching experience of four (4) years and a teacher-leadership experience of three (3) years. Calvin had not attended any Teacher-Education College training. Rather, he enrolled directly into University Teacher-Education course after completing his secondary school education. Calvin had attended a one-day in-service training session covering the implementation of the 2005 Tanzanian ISCS Curriculum.

Chiku, a Chemistry Teacher, had nine (9) years of teaching experience all of which she spent in this case-study school. Like the GAM, Chiku attended College and University Teacher-Education. During the study, Chiku had the opportunity to attend a one-week professional training course on how to enhance the implementation of the 2005 Tanzanian ISCS Curriculum using Information and Communication Technologies.

Chaula is a Biology teacher. She started teaching this subject just after she graduated from her University Teacher-Education course in 2014. Therefore, at the time of this study, she only had three (3) years of teaching experience all of which she had gained at this school. Importantly, Chaula had not attended any additional professional learning to advance her knowledge regarding the new curriculum. Being one of the junior teachers, Chaula was also allocated to the office occupied by other junior teachers and had little access to, or support from, more experienced colleagues.

The last participant in this school was Chesco, a Biology teacher. He started teaching in 2009 and commenced working in this school in 2014. Chesco had not attended a Teacher-Education College. He directly enrolled into University Teacher-Education after he had completed his Secondary School Education. Therefore, at the time of this study, Chesco had roughly three (3) years of teaching experience.

5.2.2. Leadership of adoption and implementation

This subsection presents findings regarding the way in which adoption and implementation of the 2005 Tanzanian ISCS Curriculum was monitored and guided by SBLs in this case-study school.

The analysis produced two categories of themes. The first category is directly related to the transition-leadership strategies. These were ‘expected’ themes for they address issues that are directly related to the research question. The second category relates to the challenges that affected the change management process in one way or another. Issues in this category are referred to as ‘unexpected’ because they emerged from the participants’ accounts. The researcher did not question them as he did not intend to explore their existence.

5.2.2.1. Monitoring the implementation

Findings demonstrate that SBLs in this case-study school monitored the teachers’ adoption of the 2005 Tanzanian ISCS Curriculum and uncovered their science-teachers’ concerns in dealing with this curriculum using three strategies: observations, questioning of students, and inspection of teaching-related documents.

5.2.2.1.1. Observation

Observation appeared to be one of the primary approaches used by SBLs to monitor the progress of the change adoption, and the related implementation in this case-study school. Evidence for this practice was revealed nine (9) times in the data collected from all the five (5) interviewees. These included statements such as: “*I have seen the School Principal walking around several times while teaching sessions are in progress*” (Chiku), and “*One day she [the case-study school Principal] told me that she would come to observe my class session, and she actually did.*” (Chesco).

However, of these nine (9) statements, seven (7) revealed the prevalence of informal observation practices. Calvin was the only SBL who claimed having conducted formal observation of his colleagues. In fact, even Calvin himself was heard declaring that, “*I do it less often*”. As such, there was robust evidence to infer that SBLs relied on informal observation practices to monitor teachers’ curriculum adoption and implementation in this case-study school.

The effectiveness of the ways in which the SBLs observed teachers seemed somewhat doubtful. Statements such as, “*I pretend to go there [in the classroom] for a different reason while my aim is to observe the way they are implementing*” (Christina, the GAM) and “*... but she [the school principal] does not stand there [outside classrooms] for a long*

time ...” (Teacher Chaula), suggest that SBLs were observing not only in a manner that disguised the actual objective of the observation mission, but they were also doing it very briefly to the extent that anyone might question the success of the entire undertaking. These practices may signal that the SBLs in this LPS were not very knowledgeable of how to carry out this process.

5.2.2.1.2. *Questioning of students*

Three (3) participants (out of 5), indicated that it was the SBLs’ common habit to question students about the science teachers’ curriculum implementation. SBLs, according to these participants, tended to convene meetings with students and probed them how they were being taught, and whether, or not, they were satisfied with it. Some of the exemplifying statements for this theme were, “*She [the GAM] informs us that students are complaining about the way we teach*” (Chesco) and “*They [SBLs] also ask them [students] whether they understand us, or not*” (Chaula).

SBLs were of the view that this strategy helped them to gain substantial information about teachers’ classroom practices. For instance, the GAM stated, “*Students tell us many things. They tell us how they are engaged in learning, and the kind of hands-on-activities they are assigned by their teachers*”. Perhaps because they perceived they were getting valuable information, SBLs used this strategy regularly. The study revealed that “*They [SBLs] often do it [check students' opinion about teachers' implementation practice] before convening any staff meetings*” (Chaula).

5.2.2.1.3. *Document inspection*

Inspection of teachers’ documents by the SBLs emerged to be another strategy for monitoring adoption and implementation of the curriculum in this LPS. The analysis coded eight (8) statements describing the use of this strategy by four out of five participants.

The SBLs often ordered teachers to collect their intended written Lesson Plans on Fridays of a week preceding their use, and the Schemes of Works at the beginning and end of every term. The data showed that SBLs also inspected the Logbooks and Class Journals only a very few times in comparison to the Schemes of Works and Lesson Plans.

However, the way SBLs inspected documents signalled that their intention did not appear to ascertain teachers' quality of curriculum adoption. There was enough evidence to suggest that their intention in inspecting teachers' document in this LPS was largely to determine the pace at which teachers implemented this curriculum. Part of this evidence were statements from SBLs themselves, which included: "*when I inspect them [Lesson Plans and Scheme of works], I can identify teachers who are lazy*" (the HoD).

While such perceptions were also heard from teachers ("*I think they inspect them [Lesson Plans] to crosscheck if we dodge our periods*" (Chesco)), the realisation of this tendency was further corroborated by the fact that the SBLs rarely inspected these documents, and when they did, they very occasionally put in some written comments. More importantly, a few comments made by the SBLs in these documents were not very rich to guide teachers. These signalled that the SBLs collected instruction documents mainly to monitor the pace of teaching rather than to gauge and guide the quality of curriculum implementation.

5.2.2.2. Guiding the implementation

The researcher explored how SBLs addressed teachers' concerns about the implementation of this curriculum. Various responses to interview questions about this issue were collected from SBLs and were authenticated using teachers' accounts. The analysis of these responses coupled with data from observations and the document reviews resulted in the findings organised into the three themes discussed below.

5.2.2.2.1. Use of authority power

In the LPS, seven statements that signalled SBLs' tendencies of using their formal authority and power to influence the adoption of the 2005 Tanzanian ISCS curriculum were noted in the data collected from four participants (4 out of 5 agreement). These included phrases and statements such as, "*We try to do it that way [inspecting Lesson Plans every week] to enforce the implementation*" (Christina, the GAM), which was echoed by Calvin (the HoD) who said, "*They [teachers] know that I am very strict on this issue [covering their syllabuses]. I do not welcome any excuse for any failure*". The presence of terms such as 'enforce' and 'strict' in such statements coupled with Calvin's facial emphasis (eye gaze and dilated eyes) about this point strengthened this inference.

Further evidence signalled that it was part of the SBLs' habit to 'enforce' accountability based on compliance with task specifications (i.e., focusing on how much one has done) rather than how well a task is carried out in this case-study school. Rather than supporting teachers to solve curriculum implementation challenges, Calvin's descriptions of his own leadership practices, for instance, illustrated that he focused more on ensuring that every teacher covered the syllabus. Calvin explained:

Ngoja nikuambie, sababu haziwezi kuisha. Kwa hiyo, bila kujali sababu, 'kukava muhtasari' ni jambo la lazima. Na waalimu wanajua msimamo huu. Sina mchezo katika hilo. Niamini mimi, bila kuwa mkali waalimu hawatafundisha huu mtaala kwa visingizio mbalimbali. Na inapotokea wanafunzi wamefeli, zigo lote la lawama linatuangukia sisi viongozi. Kwa kweli tunachokiona ni bora kusukumana hivohivo tu. (Calvin)

Translation:

Let me tell you, challenges are endless. Therefore, whatever the case, every teacher should cover the syllabus. Teachers know that I am strict on this. I do not joke when it comes to syllabus coverage. Trust me, without pushing them, they will not implement the whole syllabus because of their many reasons. And when students do not perform well, all the blames are directed to us [SBLs]. Therefore, what we see is just to keep pushing them. (Calvin)

The findings that the professional control in the school was not reconciled in a system that focuses on the needs and experience of the teachers were strengthened by Chaula and Chiku. For example, Chaula complained that teachers were deprived of opportunities to communicate their teaching-related concerns to SBLs during the staff meetings. She stated, "They [the SBLs] dominate discussions. Meetings are full of their announcements. They always tell us 'this is what you should do' in our meetings" (Chaula). Similarly, Chiku complained about the SBLs' reluctance to consider teachers' arguments in relation to the challenges they experienced or what and how to do to improve the implementation. Chiku

stated, *“We give them strong reasons. Instead of helping us solve them,”* Chiku stated, *“they blame us. It is as if they [the SBLs] have their reasons already and thus they do not trust ours”*.

Chaula and Chiku believed that even if they requested support from the SBLs, it would not be taken seriously. There was heavy emphasis on covering the syllabus and attending their class sessions rather than the efficiency of what they did in their classroom. *“I teach very overcrowded classes here; come and see it for yourself”*, Chiku stated, *“I have told them [the SBLs] several times about this problem, but I ended up encountering the same song: ‘You should ensure you cover the syllabus while we are working on the matter’”*.

The lack of teachers’ voice in these discussions may imply that the SBLs expected teachers to implement this curriculum under conditions that were administratively convenient, but not deemed favourable by the teachers themselves. The SBLs emphasised teachers to do ordered things rather than doing them in the right way or the best ways they see them working. Apparently, this would indicate nothing but the SBLs’ tendencies of turning themselves into enforcers who stress compliance rather than efficiency in relation to the implementation of the curriculum.

5.2.2.2.2. *Delegation of intervention roles*

Various forms of delegation, sharing, and distribution of intervention tasks among the SBLs were also revealed in this case-study school. Evidence for such practice started to emerge as the School Principal was referring the researcher to some key informants. The principal was clearly heard stating that she delegated a large part of the teaching supervision tasks to the GAM, and as such, she recommended that the researcher should consult the GAM for everything related to this investigation.

Channelling the intervention along the management hierarchy was further evidence for this theme. The GAM’s description of how she solved concerns encountered by science teachers included statements such as, *“what I then did was, you know, to inform the School Principal about it, who, in turn, advised me to ask the Head of Department to talk to that teacher ...”*. Consistent evidence was provided by Chesco who echoed, *“... but she told me to communicate with her [the GAM] or my HoD. She [the School Principal] believed that*

they [the GAM and HoD] *would handle it*". Chesco provided this statement when he was describing the way he communicated his concern to the SBLs concerning the shortage of teaching-related resources.

Generally, four (4) statements from two (2) SBLs in this case-study school authenticated the fact that the SBLs tended to delegate the intervention tasks among themselves and along the administrative hierarchy, with much of the transition management work shouldered by those working closely with the teachers (i.e., the HoD and GAM).

However, there were alarming signs of the likely presence of low interaction levels between Science-Teachers and the HoD in this case-study school. Observed from the NVivo 11 Word Cloud and the related Frequency Summary was the infrequent mentioning of the HoD (only 11 hits) compared with the GAM and School Principal who were mentioned 37 and 20 times respectively. Such findings would suggest that teachers did not receive satisfactory professional support from their HoD.

5.2.2.2.3. *Meetings and discussions*

The use of meetings and staff discussions emerged as another intervention practice in this case-study school. Vignettes related to this theme were registered 17 times in the data collected from all the five (5) participants. In addition to informing teachers concerning circulars and new directives from the Ministry of Education, SBLs occasionally convened meetings during each term for intervention purposes. Participants' statements supporting this observation included, "*I also question teachers of subjects that students did not perform well to explain why*" (Calvin), and "*We use these opportunities [the meetings] to announce implementation problems that we think teachers are exhibiting in classrooms*" (Christina). In this case, meetings for them to discuss adoption were alternative ways through which the SBLs and teachers communicated issues and challenges related to the 2005 Tanzanian ISCS Curriculum in this LPS.

However, data did not reveal any evidence of the presence of one-to-one or departmental level meetings between SBLs and teachers in this case-study school. Further analysis using Text Search Query and Word Tree view of the NVivo 11 program revealed a repeated link of the term meeting with the term '*general academic*' rather than the term '*department*'.

As for the preceding Theme, this observation suggests the presence of poor interaction between the science teachers and their HoD in this case-study school.

5.2.2.3. *Unexpected themes*

Two unexpected themes emerged in this LPS. An unexpected theme includes specific issues about which the researcher did not ask. Rather, these unexpected themes emerged from the data. Nonetheless, their potential influence on change-related adoption and adoption-management processes are deemed pertinent and their descriptions are included below.

5.2.2.3.1. *Result-driven intervention practice*

The question of what motivated SBLs to seek information concerning both whether, or not, and how the 2005 Tanzanian ISCS Curriculum was implemented emerged and led to the first unexpected theme. Although SBLs were aware that seeking information concerning the teachers' adoption progress needed to be conducted continuously, this awareness did not seem to rule their practice. The status of the National Examination results appeared to be the key factor that largely triggered SBLs to search for information about what occurred in various classrooms. "...*normally if they* [students' National Examination results] *are not good, what we* [the SBLs] *do here is to question students to tell us how they are taught by teachers*" (Calvin); and, "...*when examination results are disappointing, they* [the SBLs] *question us* [the teachers] *about how we teach*" (Chiku).

The fact that the nature of the examination results was what triggered the SBLs to search for information about what transpired during the teaching process was further strengthened by document review findings. From the inspected documents, evidence showed that SBLs tended to convene academic meetings either immediately after the National Examination results were released or to include an agenda item about it during the subsequent start/end of term academic meetings.

5.2.2.3.2. *Norms of privacy*

Ten (10) statements coded from the four (4) participants (4 out of 5 agreement) illustrated the presence of a 'norm of privacy' among staff members in this case-study school. Data

revealed the presence of attitudes and perceptions that everyone was a well-prepared teacher. Teachers were not only, as Calvin stated, “... *very reluctant to hunt for help from colleagues*”, but were also “*too defensive*”, as Christina, the GAM, said, “*when they are questioned concerning their classroom practices*”.

Perceptions of professional autonomy, traditions of classroom independence, and equal status were also revealed in the way SBLs interacted with teachers. SBLs appeared extra cautious about not threatening their professional and collegial relationships with teachers. “...*but the circumstance demands us to keep a boundary between guiding them [teachers] and interfering their professional work*” (the GAM). Illustrating the same opinion, Calvin stated:

Unaposema umchunguze mtu, meseji inayoonekana kwa haraka ni kwamba humwamini.... Nadhan inakuwa ngumu kwetu sote kumwambia mtu kuwa hafundishi vizuri. (Calvin)

Translation:

When you observe somebody, the message is that you do not trust her/him.... I guess it is very difficult for all of us to approach someone and tell her/him that s/he is not teaching well here.... (Calvin)

Similarly, as Chiku explained why SBLs did not detail teachers’ incompetence in the meetings, she echoed the GAM’s opinion by stating, “*Challenging what another person thinks to be the right way, you know, is not easy. It is complicated*”. Even though she did not explain what complications to which she was actually referring, her facial expression and the circumstance of the interview signalled the likelihood that Chiku was addressing the same concern, that is, the difficulty of separating transition-guidance from judgments of the one’s teaching-related competence.

5.2.3. Teachers' implementation of the curriculum

The researcher observed the teaching sessions of four (4) participant-teachers, reviewed their documents, and engaged them in one-on-one interviews to reveal the Level of Use and Configuration of their implementation of the 2005 Tanzanian ISCS Curriculum. How teachers dealt with the essential components of this curriculum is detailed in the following subsections.

5.2.3.1. *Instructional Planning*

Teachers continuously documented their instructional planning in both their Schemes of Work and their Lesson Plans. In many of the inspected Lesson Plans, however, evidence showed that their instructions repeatedly unfolded in the same way regardless of the nature of contents they taught. Evidence for this deduction included the repetitious way in which they commenced and concluded their lessons and in the restricted variety of activities that most teachers regularly performed.

All teacher attempted to adhere to the principle of progression. They often planned to start their lessons by checking the preconceptions of their students, mainly through questioning. However, more than half of the reviewed documents indicated lack of any detailed preparation of lessons, and an over-reliance on textbook-contents. All examples, exercises and teachers' descriptions of concepts and theories, for example, were exactly as in the textbooks. Most teachers stated that they largely relied on the textbooks because "*it [the Biology textbook] exactly reflects the syllabus organisation*" (Chacha), and that "*I do not want my students to be bombarded with different descriptions of theories*" (Chaula). Such practices may suggest that students ended up being inadequately motivated to search for alternative elaborations of concepts and theories.

5.2.3.2. *Presentation location, materials and facilities*

Teaching largely occurred in ill-resourced classrooms. Participant teachers informed the researcher that they also used laboratories, albeit only periodically, to guide students to carry out practicals or to demonstrate some scientific concepts. All interviewees described carrying out outdoor learning sessions, but the researcher's observations revealed that only Chiku and Chaula actually did this instruction.

None of the participant teachers mentioned using modern technologies, especially the ones that integrate visual and audio (audio-visual) into their instruction processes. Essentially, teachers complained that they lacked access to teaching facilities containing such technologies. Even when teachers had to teach complex concepts or processes, they enhanced their instruction and communicated key lessons ideas only using visual aids, specifically still pictures, figures, sketches, or illustrations.

5.2.3.3. *The teaching process and strategies*

All teachers demonstrated over-prescriptive starting points in their teaching, and most of them regularly unfolded their instructions in almost the same manner. Lecturing was their regular technique, but they supplemented it with questioning, discussion, and sometimes with demonstrations. Evidence for the use of inquiry methods was not abundant. The following subsections highlight the level and configurations of implementation and how these varied between teachers.

5.2.3.3.1. *Direct instruction*

The statement presented above, which was also noted in other colleagues' accounts, was part of Chiku's brief explanations of her own teaching process. It was obvious from such statements that lecturing was hidden in the name of 'introducing and briefly explaining the topic' and appeared to be the main approach used by all teachers.

Mara tu baada ya kusalimiana na wanafunzi, huwa naandika mada ubaoni na kutoa utangulizi aaah naelezea kidogo juu ya mada husika. Baada ya hapo, huwa nawauliza kama kuna yoyote ana idea' ya hiyo topic. Nawasikiliz na kama nikibaini mapungufu nina... (Chiku)

Translation:

Immediately after greetings, I write the topic on the board and introduce it. Um, I explain to them what the topic is briefly about. I, then, ask if there is anybody with an idea about the topic. I listen to them and if I notice a gap, I start to clear it. I explain a little and (Chiku)

Further lecturing characteristics were noted during the classroom observations. Students were only seen talking when answering teacher's questions. Even though many teachers claimed that "*I have tried several times to involve them, but ... I just ended up getting bored...they just sit looking at you as if ...*" (Chaula), the analysis revealed that teachers themselves were the source of this student behaviour in classrooms. Chacha, for instance, was heard three (3) times (in different teaching sessions) stating "*Silence please, who is talking there?*" The researcher's observations of Chaula's lesson revealed that whenever a student had difficulties in describing something, she regularly intervened. She quickly provided accurate explanations without even checking if other students in the classroom could explain it or not. Generally, teachers tended to be strict, to spend large amounts of time talking and writing notes on the board, and to keep students quiet and attentive to what they had to say.

5.2.3.3.2. Questioning

The question-and-answer instructional method was noted being used by all teachers, especially when introducing their lessons. When introducing their lessons, however, teachers appeared to be more concerned with connecting knowledge taught in the previous lesson rather than connecting students' preconception with the new subject matter. Their typical interview arguments regarding the use of this method include: "*...then, I use their responses to decide whether I should repeat teaching it [the previous topic] or present the new topic...*" (Chacha). This inference was later authenticated through the observations.

Questions were answered on a volunteer basis in most cases. However, teachers employed two strategies to ascertain if other students had the same or different views on the issues about which they were being questioned. Focusing on whether, or not, most students have succeeded in providing correct answers was the first strategy. "*If most students respond correctly to my questions, then I am confident that my lesson is understood*" (Chiku). The other supporting statement included, "*The number of hands raised by students to respond to my question tells me how much the issue is understood*" (Chaula). Most of the teachers recorded students' ideas on the blackboard and then conducted a voting-like activity, but without asking for comments on the arguments provided by previous students. Chacha's

descriptions of his teaching, part of which is in the following quote, explained well this process:

Kila ninapomsimamisha mwanafunzi kujibu maswali, huwa naorodhesha point zake ubaoni. Nafanya hivi kwa wanafunzi kadhaa na baada yah apo naligeukia darasa na kuwauliza wanaounga mkono kila point kunyoosha mikono. Kupitia idadi ya mikono naweza kuconclude kiwango cha uelewa wa darasa langu.
(Chacha)

Translation:

Every time I pick a student to respond, I note down her/his responses on the blackboard. After doing this for several students, I turn to the whole class and ask those agreeing with each provided response to raise their hands. From the number of hands, I can conclude the degree of understanding of my students.
(Chacha)

Students' failure to attempt to respond to teachers' questions was discouraged in ways such as, "*I order them [students] to remain standing for a little longer while their colleagues are seated*" (Chaula). Participant teachers believed that such measures were suitable to activate students' learning because, "*No one, you know, wants to stand for a long time*" (Chaula).

5.2.3.3.3. *Grouping and discussion*

The use of grouping and discussion strategies was first revealed by the *Word-frequency* and subsequent *Word-Tree* analyses using the NVivo-11 program. From such analyses, '*Group*' and '*discussion*' appeared not only to be the frequently mentioned terms in the interview transcripts, but also were used next to each other.

Further analysis of the participants' accounts revealed two main grouping approaches in this school. The first approach was the '*buzzy grouping*' and was employed by all teachers. When teaching, most teachers instructed students to assemble themselves into small groups

and then assigned them a question to discuss. Given that classrooms were overcrowded (as portrayed in Figure 1), discussion groups tended to be large and sitting close to one another. Such situations were seen to generate difficulties for teachers to move around to guide students' discussions. Alternatively, teachers created what Chiku termed as “*learning teams*”. These, from further follow-up discussions, were revealed to be teacher-created long-lasting groups of not less than 15 students, primarily used for carrying out assignments during the after-school hours. Chesco exemplified the typical use of these groups. On one occasion, he instructed students:

Hakuna anayeonesha dalili za kutaka kujibu ee? Hamna shida, sasa [swali] linageuka kuwa homework. Mtafanya kwenye makundi yenu yale. Tafuteni muda, mkutane, mjadiliane leoleo. Keho nitahitaji mrejesho wa kila kundi. (Chesco)

Translation:

It seems no one wants to answer this question. No problem. It now turns out to be your homework. You will do it in your [permanent] groups. Find time, meet and discuss it today. Tomorrow I will ask every group. (Chesco)

Although teachers expressed the idea that “*I like this strategy [grouping] because it makes my students very active*” (Chesco), all interviewed science teachers could not describe how they ascertained the accountability of every student in the group work. Even when presentations of group work were occurring, the researcher observed only one student from each group presenting and very few group members answering questions from their peers or the teacher.

5.2.3.3.4. Demonstration

To a large extent, demonstration processes involved pictures, flip charts, and models rather than the use of concrete materials from the surroundings. Chaula and Chiku appeared to be the only teachers who occasionally attempted to demonstrate with real materials in their lessons.

Importantly, teachers carried out demonstrations using pictures, illustrations, models, and flip charts at the front of classrooms, and while students were seated. Given the fact that classrooms were overcrowded, most of the students were deprived of chances of making thorough observations of the demonstrated things.

For demonstrations that involved real materials, some improvement was noted. During her lesson about immiscible liquids, Chiku, for instance, reported that she brought water and oil to the classroom, *“I mixed these liquids in their [the students’] presence and then showed them how easily the mixture could be separated”*. To foster students’ participation, Chiku reported that she requested students to bring these materials from home. Chaula, on the other hand, provided accounts of how she taught the concept of pollination in plants. *“Therefore, I took them to outside to observe how insects facilitate the whole process of pollination”* (Chaula).

5.2.3.3.5. Hands-on activity teaching

Two categories of hands-on activities were regularly conducted by all participant teachers in this case-study school: laboratory practicals and brief classroom activities. Chiku and Chaula were the only teachers who reported supplementing these with learning activities outside the laboratories, some of which were illustrated above in the demonstration theme. As such, the researcher concluded that laboratory practicals were the main hands-on teaching strategy used in this case-study school, albeit infrequently.

The analysis revealed that teachers regularly structured laboratory practicals in such a way that students had to follow controlled procedures to attain the already known or predicted results. For instance, Chaula was observed outlining required procedures on the blackboard for the students to follow when conducting practical work. This behaviour signalled that laboratory activities were only for backing up claims made in class with evidence.

5.2.3.4. Summary

Table 7 summarises the actual backwardly mapped implementation and shows variations across teachers in the implementation of the 2005 Tanzanian ISCS Curriculum. This summary illustrates the extent to which the actual implementation process in this case-study school reflected the proposed operational form.

As findings show, student-centred instructions mainly occurred through questioning and discussion. Graphical organisation, concept mapping, flow charts, and other recommended strategies for creating interactive instructions, were, not observed. Even with the observed methods, the configuration of the implementation was not very rich. For instance, teachers' questioning largely focused on facts, and in most cases encouraged individual responses. These results suggest that teachers failed to promote advanced forms of student-centred learning in their classrooms.

Inquiry-based instructions were implemented using guided laboratory practicals. Out-of-laboratory activities were not only infrequent but also were implemented by few teachers. On these grounds, a large part of hands-on activities intended nothing other than to teach students to follow some precise ways to achieve the already-known outcomes, mainly for backing up claims with evidence. The project, problem-based learning, research and advanced forms of inquiry teaching processes, which could encourage students to extend or discover knowledge as largely envisioned in the 2005 Tanzanian ISCS Curriculum, were not part of the actual teaching configuration.

On these grounds, it could be stated that the configuration of implementation in the LPS embodied only a small part of the practices recommended in the 2005 Tanzanian ISCS Curriculum and that the teachers' level of use of these was rudimentary at best.

Table 7

The Backwardly Mapped Configuration of Implementation of Curriculum components for the LPS

Component		Teacher			
		Chesco	Chaula	Chacha	Chiku
Location of the lesson		- Often in the classroom - Used laboratory for compulsory practicals	- Often done in the classroom - Rare laboratory uses because the lab was ill-resources. - Rarely conducted outdoor learning E.g., observing insect pollination	- In the classroom - Rare evidence of using laboratory was noted, particularly for demonstrations	- Often in the classroom. - Sometimes used the laboratory - Weak evidence on the outdoor learning
Teaching aids and materials		- Used blackboard for presentation. - Charts, pictures and sketches enhanced presentation	- Often used Charts, pictures and sketches - Rarely mentioned using real materials	- Often used charts, pictures and Models. - Used real materials for demonstration only once in six months	- Enhanced learning with charts, models and pictures. - Sometimes asked students to bring some of real materials from home for demonstration
P e d a g o g i e s	Direct instruction	- Controlled the pace and nature of activities occurring in the classroom - Spent more time talking	- Relied on lecturing because “<i>some topics such as meiosis are very abstract and there are no ways to demonstrate them</i>” - Students voiced only when answering questions or discussing	- Teacher controlled pacing and dialogue (“<i>I do not let them talk more due to lack of time</i>”). - Started to describe concepts without even gauging students’ awareness	- Tended to describe concepts without first gauging students’ understanding. - Never allowed students to talk. “<i>Once I enter classroom, I order all students to listen me</i>” - Demonstrated seriousness and strictness in the classroom
	Inquiry-based and student-centred instructions and activities	Employed questioning strategy but responses were often from individual students	- Students were activated to respond using: - Volunteer technique - Basketball (random and any)	- Only oral questioning was revealed. - Volunteer technique used to pick students to respond	- Response were often orally. - Students were activated to respond using: - Basketball (Random and volunteer technique).
		Buzzy grouping indicated in some sessions	- Group works noted but never assigned performance-based activity - Buzzy and think-pair-share discussion were noted	- Group discussion - Buzzy grouping - Groups only used to discuss something during the lesson	- Always used group discussion method. - Buzzy group and Learning teams - Groups only met when discussing something during the lesson
		When necessary, he arranged guided practicals for students	- Teacher-guided laboratory practicals. - Outdoor hands on activities E.g., observing insect pollination.	Organised teacher-guided laboratory practicals but not often due to time & resource	- Enhanced instructions with simple activities. Eng., separation of immiscible liquids - Provided students with guided forms of practicals - Employed reflective practices

5.2.4. Teachers' concerns about the curriculum

This section details the Stages of Concerns (SoC) of the four science teachers in the low performing case-study school. An illustration of the SoC Profile of each participant teacher and the related description is presented first; thereafter, these SoC Profiles are combined in the same figure to allow for a holistic analysis. Therefore, the case-study school's SoC Profile will be interpreted by both tallying the number of participants who scored higher at each SoC and by considering similarities in the trends of their profiles.

5.2.4.1. *Teacher Chesco's Stage of concerns (SoC)*

As illustrated in Figure 4, Chesco's highest level of concern is at Stage 0-Awareness (or Unconcerned), suggesting that he is aware of the 2005 Tanzanian ISCS curriculum. His second most intense concern is at Stage 3-Management, indicating that he is worried about how he would handle this curriculum within the perceived logistic limitations. The fact that Stage 1-Information and Stage 2-Personal are lower compared with Stage 0-Awareness and Stage 3-Management concerns may indicate that he has already dealt with these two intermediate concerns. Alternatively, it might be that he is yet to become more concerned about them.

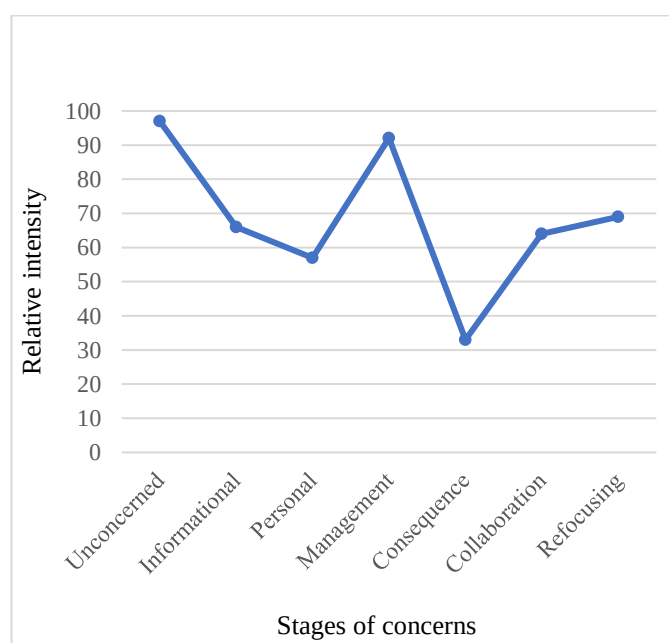


Figure 4. The SoC of teacher Chesco.

A slightly worrying feature of this profile is the “tail-up” at Stage 6-Refocusing, which signals that he has alternative ideas about how to implement this curriculum. This profile shows that teacher Chesco’s Stage 6-Refocusing concern requires clarification to ensure that such ideas do not interfere with the implementation intended by designers of this curriculum.

5.2.4.2. *Teacher Chaula Stage of concerns (SoC)*

Chaula, as shown in Figure 5 had no concerns lower than the 59th percentile, indicating that she was relatively concerned about all domains. It might be that she is “*naturally anxious*” about innovations or perhaps because she is relatively new to the teaching profession with only three years of experience.

Even though it was her lowest concern, Chaula was still relatively worried about the Impact of the 2005 Tanzanian ISCS curriculum on students (Stage 4-Consequence), and her most intense concern was at Stage 6-Refocusing. Chaula’s next most intense concerns were on the Stage 1-Information and Stage 3-Management. Thus, she has a classical “two-humped” second most intense concerns profile.

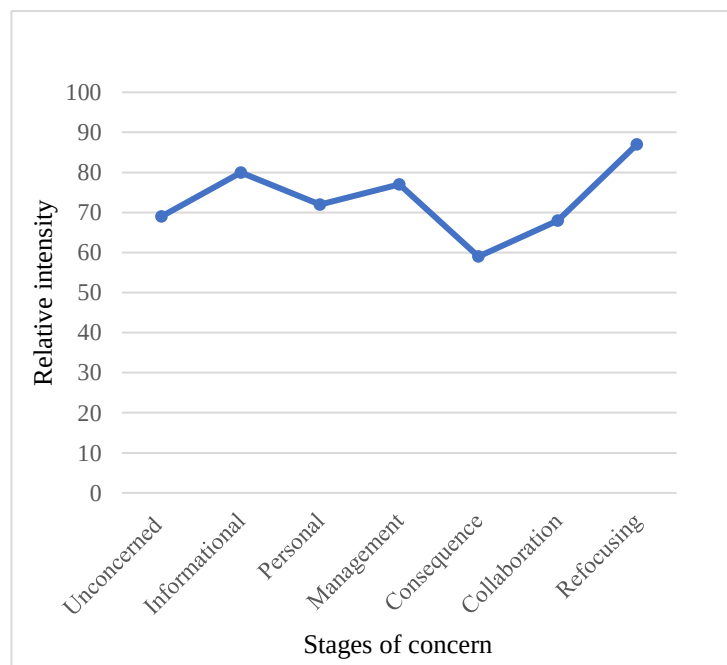


Figure 5. The SoC of teacher Chaula.

The tailing up of the Stage 6-Refocusing concerns might mean that she was trying to use alternative implementation techniques, perhaps with the support from colleagues as indicated by the moderate Stage 5-Collaboration concerns, although these are at the second lowest level of all her concerns.

To a certain extent, this Profile mirrors observation and interview data collected from Chaula. During the interviews, Chaula complained about lacking contemporary presentation facilities, because of which she stated that she taught topics such as Meiosis and Respiration simply by chalkboard illustrations and other traditional means.

Even though Chaula indicated some interest in learning how to solve some of these challenges from her colleagues, the allocation of the teachers to separate offices did not favour her on this issue. As reported previously, all junior teachers such as Chaula in this case-study school were allocated to a separate office from that of senior teachers, and their offices were considerably distant from each other. Hence, there were limited opportunities for senior teachers to mentor the junior ones.

5.2.4.3. *Teacher Chacha's Stage of concerns (SoC)*

As Figure 6 illustrates, Chacha was highly concerned at Stage 1-Information regarding this curriculum. Coupled with the second highest Stage 0-Awareness concern and his third most intense concern at Stage 2-Personal, his profile is likely indicating that he is still at an early stage of the adoption. That is to say, even though Chacha had a teaching experience of nine years, his profile reflects those who are just beginning to implement an innovation.

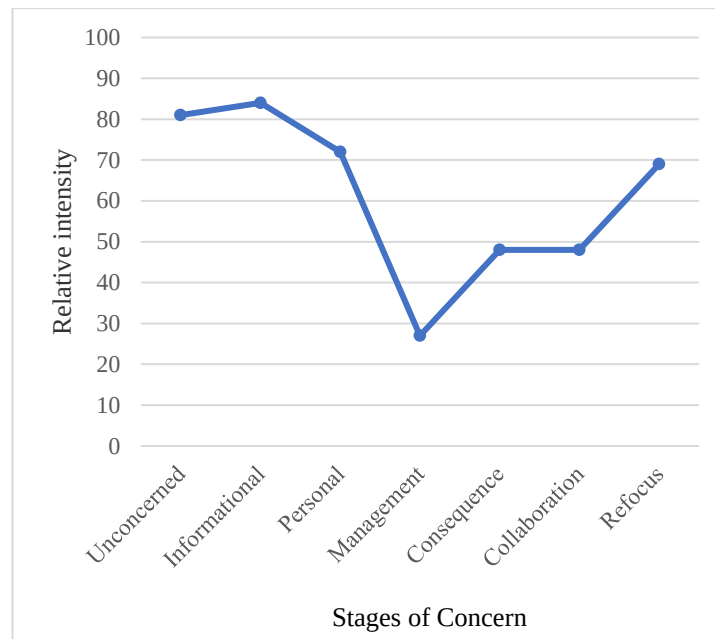


Figure 6. The SoC of teacher Chacha.

The tailing up of his Stage 6-Refocusing concerns may be a major warning sign. It shows that he has ‘other implementation ideas’ that do not likely align with the recommended curriculum operations. This appears to be a reasonable interpretation of his profile given the fact that Chacha’s awareness of this curriculum was low and that he had little confidence he could handle it.

5.2.4.4. Teacher Chiku Stage of concerns (SoC)

Chiku’s SoC Profile is indicated in Figure 7. Typically, her most intense worry was related to the logistical aspects as indicated by the peak at Stage 3-Management concerns. Her second most intense concern was at Stage 4-Consequence. That is, how she could bring about positive curriculum outcomes for her students. Her moderately high concerns at Stage 4-Consequence were likely influenced by her dissatisfaction with the classroom environments, including large class-sizes and the lack of resources, major issues which emerged during the interviews. Notwithstanding that Chiku was worried about the threats to the functioning of this curriculum under such limitations, there is an indication that she had no other ideas of how to improve the implementation as shown by the tailing down at Stage 6-Refocussing concerns.

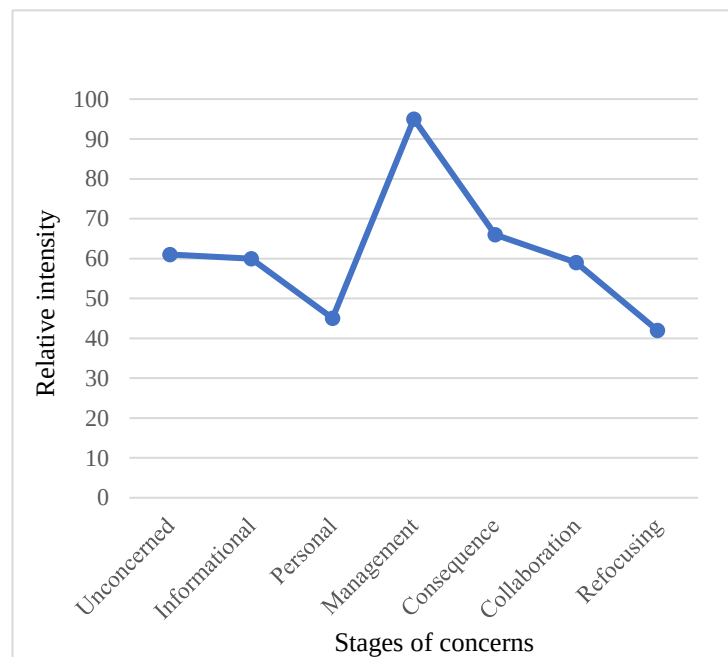


Figure 7. The SoC of teacher Chiku.

Chiku’s Stages of Concern profile, in large part, echoes her interview accounts in which she distinguishes herself as a well-prepared teacher, primarily because she had attended both College and University Teacher-Education. She criticised her colleagues who had enrolled into University Teacher-Education directly after their Secondary Education in that they are not as good as those like herself. Scoring lower on Stage 2-Personal Concerns echoes this stance. Chiku perceived herself to be capable and possessed a few personal doubts about her ability to implement the curriculum.

5.2.4.5. The Lower Performing case-study school (LPS) SoC Profile

It is clear from Figure 8 that three of the four teachers had concerns about Stage 3-Management issues. Similarly, the ‘tail-up’ at Stage 6-Refocusing concerns appears to be relatively intense for three of the teachers. The fact that teachers in this case-study school exhibited more intense Personal and Management concerns than at the Impact levels might indicate that they were still in need of addressing and solving their early level concerns in dealing with this new curriculum.

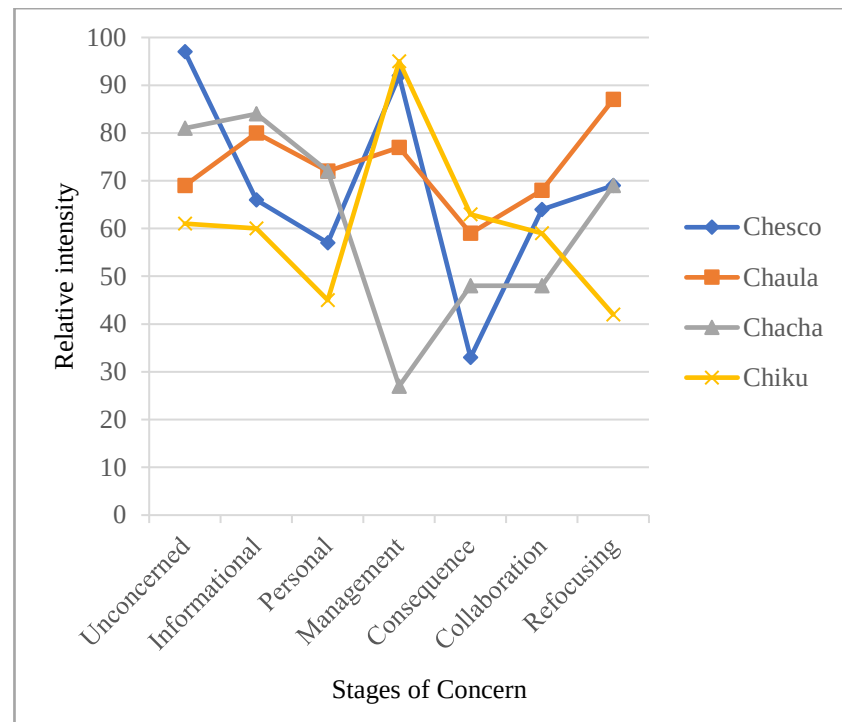


Figure 8. The LPS SoC profile.

The proportion of the higher Stage 6-Refocusing concerns relative to the Management ones in this case-study school is, perhaps, not very surprising as they echo the data collected through interviews and observation. Since only 12 science teachers were teaching science students across all the 4 grade levels and since they complained about having more than 70 students in a classroom with no modern presentation facilities, the only option for them to ease the implementation was to revert to teacher-centred pedagogies, particularly lecturing, which is ‘easier’ in such contexts.

Figure 8 shows further that the variation in the trend of concern profiles exhibited by each participant in this case-study school was large. This might mean that there was a lack of cohesion and teamwork among these teachers. This could also be explained by the structural arrangement of teachers in this case-study school. Not only were both senior and junior science teachers allocated to separate offices, they were also assigned to offices regardless of the subjects they were specialised to teach. Structurally, therefore, there was little opportunity for these science teachers to collaborate.

5.2.5. Overall summary for the LPS

The three sections presented findings regarding the main issues in the LPS. The first issue was about the ways through which SBLs' guided science teachers' adoption and implementation of the 2005 Tanzanian ISCS Curriculum. Then, the findings regarding teachers' configuration of implementation and SoC profiles were presented. Information covering these same aspects for the MPS are presented in the following section.

5.3. Case-study school 2: The medium performing school

This section presents the findings concerning the Medium Performing School (MPS). Like before, the presentation of findings starts with the description of the context and other related information. Then, the findings covering the activities, strategies, and leadership behaviours employed by SBLs in their attempts to institutionalise the 2005 Tanzanian ISCS curriculum are presented. This is then followed by the findings concerning the extent to which teachers have adopted this curriculum and concludes with an analysis of their concerns. As emphasised previously, this later information is aimed at depicting the level of achievement of SBLs in this LPS in guiding the science teachers' adoption of this curriculum.

5.3.1. Context and background of the MPS

Like the other two case-study schools, this MPS is located not far from the town centre. In contrast to the LPS, because of its location near to the neighbouring institutions and offices, its setting seemed noiseless and conducive for teaching and learning processes.

Originally, this school was not owned by the Tanzanian Government. However, as has been the case with many other private schools in the first twenty years of the Tanzanian independence, this case-study school was handed over to the Government in the early 1980s.

5.3.1.1. *Population and infrastructures*

At the time this study was conducted, the school enrolled students of both sexes and provided both lower-level and higher-level secondary education. The total number of students was about 700. The lower-level secondary education students were the day-attendees. That is to say, they went home after class-hours in the evening, where they lived with their parents or guardians. Attendees whose parents lived far from the school rented private accommodation within the school grounds.

In terms of infrastructure, the situation was somewhat better compared with that of the LPS described in the previous Section. The MPS had many buildings and they were attractively arranged. More importantly, every science-subject had a well-furnished laboratory, each of which could take up to 60 students per session. Laboratories were better designed than those found in the LPS. Nevertheless, a lack of modern equipment and apparatus was also observed. Additionally, science teachers complained about the inadequate supply of laboratory reagents to conduct sufficient number of experiments and practical activities. Each curriculum subject had an office containing same-subject teachers. Most likely, such staff arrangement permitted the interaction of teachers with diverse teaching experience.

At the time of this study, there were 20 Science and Mathematics teachers. 7 of these teachers taught Biology; 6 taught Chemistry, 3 taught Physics; and, the remaining 4 taught Mathematics.

There were 340 junior secondary school students taking science subjects in this case-study school. The number of science students in some grade-levels in this case-study school was less than 45, which is conducive to smooth teaching or learning processes. Figure 9, which shows the presence of 23 science students attending a laboratory class, exemplifies it. Other grades, nevertheless, had more than 45 science students. Therefore, the ratio of science students to science teachers in this school varied.

The Principal was responsible for promoting and maintaining the teaching and learning standards as well as the smooth running of the school. As such, the Principal was responsible for both academic and non-academic leadership in this case-study school.

To increase the curriculum-leadership efficiency, the Principal devolved a large part of the academic leadership roles to the General Academic Master (GAM). That is to say, the GAM was the person actively responsible for the day-to-day supervision of teaching. Because of the size of this case-study school and to fit with subject-specific demands, the GAM had two assistants (one for the Arts and the other for the Science Subjects), and who worked from the same office.



Figure 9. Students conducting a chemistry practical.

(Photograph taken by the researcher in October 2017)

In the same way, the GAM and assistants worked in collaboration with the Heads of the Department (HoDs). To allow the HoDs to work more closely to, and with, teachers in this MPS, each of them shared his/her office with the same-subject teachers. Likely, this arrangement of staff members helped to smooth the HoD's undertakings of guiding the curriculum implementation in this case-study school.

5.3.1.2. Description of study participants

The researcher invited seven (7) members of the academic staff to participate in this study: 4 science teachers, the HoD, the GAM; and the School Principal. All of them agreed to participate prior to the beginning of the study. Nevertheless, only five of them persisted to the end of the study. The school principal and one of the chemistry teachers, Birgitta, could not participate to the end due to the following reasons.

The Principal travelled to China for eight weeks of official duties. He flew to China in October 2017, a month after the study commenced, and returned in December 2017. After he returned, his commitment to the study decreased because he said he was busy resolving many pending issues tabled at his office during his absence. Early during the study, Birgitta responded to and returned the SoC questionnaire. When the research interviews commenced in September 2017, Birgitta had permission to attend to personal affairs. After she reported back, plans to interview and observe her curriculum implementation were made but she was unexpectedly transferred to another quite distant Secondary School. However, the researcher accessed some of Birgitta's instruction records, in particular, scheme of works and lesson plans, for the previous years from the HoD's office.

Pseudonyms ascribed to each participant from this case-study school are presented in Table 8.

Table 8
Participants and Their Pseudonyms

S/No	Name/title	Pseudonym
1	The General Academic Master (GAM)	Bakari
2	The Head of the science Department (HoD)	Bernard
3	Biology Teacher 1	Bertha
4	Biology Teacher 2	Batuli
5	Chemistry Teacher 1	Beatrice
6	Chemistry Teacher 2	Birgitta

Bakari started teaching in 2010, one year after he graduated from a university teacher-education course. Until the time of this study, he had worked in two different public secondary schools. He started working in this case-study school in 2011 and was appointed to the GAM post in 2016. Although at the time of this study Bakari lacked substantial teacher-leadership experience, his participation in this study was useful as the researcher expected to get from him some insights into leadership issues confronting less experienced SBLs.

Bernard, the HoD, was a Biology Teacher with substantial experience in teaching and leadership. Bernard never attended University Teacher-Education. Rather, he had a Teacher-Education Certificate, which he had obtained from one of the Teacher-Education Colleges in the early 1990s. By the time of this study, Bernard had taught for 23 years in six (6) different Tanzanian secondary schools, in some of which he served as the HoD. Bernard started to work at this MPS in 2007 and was appointed to lead the Science Department in 2011.

Bertha was very experienced in teaching, having taught Biology since the late 1990s. She started working in this case-study school in 2006, one year after the introduction of the 2005 Tanzanian ISCS Curriculum. Importantly, Bertha was among the few teachers in this school who had an opportunity to attend intensive in-service training covering this curriculum. Based on such a background, Bertha was identified by the colleagues as one of the resource teachers not only within this case-study school, but also within the entire region in which this school is located.

The second participant Biology Teacher from this case-study school was Batuli, who had a medium level of teaching experience. At the time of this study, she had been teaching for 12 years, having spent the latest three years of her career working in this school.

Beatrice, the last participant in this case-study school, was a Chemistry Teacher. She had a Certificate in Teacher-Education, which she obtained from one of the Tanzanian Teacher-Education Colleges in mid-1990s. When this study was in progress, Beatrice had a teaching experience of 18 years, having spent 16 of these in this case-study school. Because Beatrice had implemented both the 2005 Tanzanian ISCS Curriculum

and the previous one, she was in a better position to provide the researcher with useful experiences and insights concerning the transition from the older one to the new one.

5.3.2. SBLs' leadership of curriculum-adoption and implementation

This section presents findings about the practice, approaches and behaviours employed by the SBLs in guiding the science teachers' adoption and implementation of the 2005 Tanzanian ISCS curriculum in this medium performing case-study school.

5.3.2.1. Monitoring classroom teaching

Generally, despite the SBLs claiming that they were not discouraged with the science teachers' adoption progress, they all thought that their science teachers still experienced major concerns and that their adoption of this curriculum, in their opinion, was not yet satisfactory. The specific strategies they employed to reveal and address such concerns included: questioning of teachers and students; inspecting program documents; and, by employing classroom observing strategies.

5.3.2.1.1. Questioning teachers

Questioning teachers appeared to be one of the main approaches employed by SBLs in this MPS to monitor teachers' curriculum adoption and implementation progress. The information concerning the use of this strategy was transcribed from the statements provided on 11 occasions by the participants.

The analysis revealed that the SBLs in this MPS regularly questioned science teachers regarding their curriculum implementation progress and probed whether, or not, they encountered challenges. This strategy helped the SBLs to be informed about whether, or not, their teachers needed any support. Batuli, a Biology teacher, stated that:

Viongozi huwa wanaitisha vikao kujadili 'progress' ya ufundishaji, na ngoja nikuambie; kwenye vikao hivi sanasana ni 'issue' za ufaulu ndo huwa zinajadiliwa. Vitu kama kwa nini 'performance iko chini au mbona somo fulani wanafunzi hawalifaulu. Katika muktadha huo kwa hiyo waalimu wa yale masomo ambayo wanafunzi haajafanya vema huwa wanapewa nafasi kubwa kulezea nini wanadhani kuwa ndio sababu. (Batuli)

Translation:

Leaders sometimes convene staff meetings to discuss about academic progress, and in such meetings, you know what? Generally, it is the performance matter that is discussed—like why the performance is low; or, why a particular subject is not being performed well. In such contexts, teachers of the subjects that have not been performed well by students normally explain what they think to be the main reason. (Batuli)

Questioning teachers about how they implemented this curriculum was also conducted in less-formal settings. Evidence, although provided by only one participant science teacher, suggested that the SBLs never locked themselves in their offices waiting for the adoption progress reports from teachers themselves. For example, in what seemed to be an act of information gathering on the adoption progress, Bertha mentioned that “*The Principal sometimes visits our office to ask us if we encounter problems*”.

Alternatively, the SBLs captured such information from informal conversations that emerged spontaneously in the staffroom as the teachers continued with their regular work. This strategy was only employed by the HoD, Bernard, who stated that “*I am attentive to every conversation that emerges in the staffroom about teaching*”. In fact, even while in the staffroom, Bernard stated that he did not keep waiting for such conversation to emerge spontaneously. He rather:

Tunapokuwa tunaongelea vitu mbalimbali wakati tunafanya kazi zetu za kawaida ofisini, mijadala inayohusu ufundishaji nayo haikosi. Ikitokea mtu akagusia changamoto anazokutana nazo madarasanai, na sisi wengine huwa tunarukia, si unajua tena, unachangia mada. Kwa mfano mtu utamsikia anasema "mimi vilevile ilinikuta hiyo jana" (tabasamu). Ni kitu kama hicho. Na kupitia stori za aina hii mie kama kiongozi napata fursa ya kubaini ni eneo gani hasa na kwa kiwango gani waalimu wanapata changamoto kuhusiana na

mtala huu. Sasa basi, ili niwe napata hizi taarifa kirahisi, ninachokifanya ni kuzianzisha stori za namna hii mara nyingi na kiujanja-ujanja. (Bernard)

Translation:

As we discuss various issues while working in our office, those related to teaching evolve as well. If one [teacher] mentions about a challenge s/he ever experienced in teaching, others would just drop-in, you know, to support the story. Um one would say like "I too had the same challenge last week or yesterday" (smiles). Something like that. And from these chats I understand where and how teachers fail to present well this curriculum. So, to ensure I am getting information such as these, what I do is to instigate such stories not only as many times as I can but also shrewdly. (Bernard)

This finding on adoption leadership may be the result of the allocation of teachers to communal subject working spaces. To work in the same office with other science teachers appeared to have helped the HoD to build a useful relationship with his science teacher colleagues. From Bernard's perspective, this arrangement was an important factor that allowed him to accomplish his leadership goals.

5.3.2.1.2. *Inspection of teaching documents*

Inspection of teachers' Lesson Plans, Schemes of Work and Classroom Logbooks was another method utilised by the SBLs in finding out whether, or not, curriculum adoption was progressing well. Statements regarding the use of this strategy appeared seven times in the dataset, and it was mentioned by all of the five participants (i.e., 5 out of 5 agreement).

As the SBLs crosschecked teachers' documents, Bernard (the HoD) stated that he and the other SBLs focused primarily on things such as what was being taught; coverage of the syllabus, and, whether, or not, appropriate teaching aids were employed. The focus of document inspections, according to the GAM (Bakari) was also on authenticating

“Whether, or not, a plan for a lesson provides any evidence that a teacher is using teacher-centred methods or student-centred ones” in the classroom.

The analysis suggested that document inspections helped the SBLs to reveal the science teachers’ challenges and various slipups they demonstrated in dealing with the 2005 Tanzanian ISCS curriculum. Bakari, for instance, understood that inspection of Lesson Plans and Scheme of Works, helped him to reveal the “variation” and “incompetence” in the way teachers were planning their lessons.

Kwa mfano, waalimu wengi wanashindwa kuandaa ‘presentation’, kitu ambacho unaweza kukibaini kirahisi tu kwa kukagua Lesson Plan zao. Kuna utofauti mkubwa sana wa namna ambavyo haya Maandalio ya Somo yanavyoandaliwa. Kuna kipendele mule, kwa mfano, kinamuhitaji mwalimu aoneshe namba atakavyoassess uwezo na ujuzi wa wanafunzi wakati darasa likiendelea. Sasa mmmh (kicheko); yaani kila mtu anaandika anavyojua yeye. (Bakari)

Translation:

For example, many teachers fail to organise their presentation, something which you can note so easily in their Lesson Plans. Significant variations are noted in these documents. One section in the Lesson Plan; for example, demands teachers to indicate how they will assess student’s competences during teaching. Now mmm (laughs); everybody does that in her or his own way. (Bakari)

The fact that this inspection strategy was given substantial consideration by the SBLs in this MPS was strengthened by two additional forms of evidence. First, it was the frequency with which the SBLs conducted such inspections. Beatrice stated that, “*They [the SBLs] ask us to collect Lesson Plans and Logbooks on every Friday for inspection*”. Second, it was the document reviews. The researcher revealed that the SBLs signed the science teachers’ instruction documents at least twice a month.

Besides asking teachers to provide their Lesson Plans, Logbooks, and Schemes of Work for inspection, the SBLs in this case-study school introduced the so-called ‘Monthly Progress Assessment Forms’. Bertha stated, *“In these forms, every teacher is required to indicate her/his adoption progress by detailing the challenges [if any] that she/he is coming across with in implementing this [2005 Tanzanian ISCS] curriculum”*. Bakari added that teachers were required to use these forms to suggest possible solutions to any adoption challenge they perceived. In this way, these forms created opportunities for SBLs, as Bakari (the GAM) stated, *“to reveal how every teacher is progressing [with the implementation] and what are their main concerns”*. Likely, information such as this helped the SBLs to decide the issues they had to pay more attention when guiding the adoption of this innovation in their school.

5.3.2.1.3. Walk-through observation

Six statements provided by three participants (3 out of 5 agreement) showed that SBLs used observation strategies to monitor the way teachers adopted the 2005 Tanzanian ISCS Curriculum. Of these statements, four of them illustrated that SBLs typically opted for the informal, rather than formal, observation tactic. Two of these suggested that SBLs preferred walkthrough observations: *“One day, I saw him [the Principal] standing outside the class as I was teaching one day”* (Beatrice) and another one from Batuli who stated, *“I have seen him [Principal] several times walking along the corridor while teaching sessions are in progress”*.

Although relying on walkthrough observations is fundamentally not a bad idea, some worrying issues emerged in relation to the way it was conducted. The analysis indicated that the SBLs in this MPS not only undertook such processes a few times in a term, but they also tended to spend only a few minutes on each occasion. Beatrice’s statement is a case in point. She stated,

Siku moja nilimuona [Mkuu wa Shule] akiwa amesimama nje ya darasa wakati mie nafundisha. Wenzangu waliwahi niambia kuwa mara nyingi huwa anasimama dirishani kwa nje. Na ndo nilipomuona siku hiyo. Hata hivyo, hakuchukua muda mrefu. Sina uhakika nini hasa huwa anakitafuta au kukikagua.... Lakini nikuambie kitu, simaanishi kuwa huwa anafanya hivyo

kila siku; hapana, huwa inatokea tu. Inaweza kuwa labda mara moja au mbili kwa mhula ndo ukamuona. (Beatrice)

Translation:

One day, I saw him [the Principal] standing outside the classroom while I was teaching. I am told by colleagues that he often stands by the classroom's windows. And that is where I saw him. However, he just spent a few minutes and disappeared. I am not sure what he exactly looks for.... But let me tell you, I am not saying that the School Principal does it every day. No, it just happens. It could be once or twice per term. (Beatrice)

The second thing noted in connection to classroom walkthroughs in this case-study school was the lack of subsequent feedback. There was evidence to suggest that the SBLs failed to share their reactions or opinions regarding what they had found out in such occasions. Part of Beatrice's statement presented above, "*I am not sure what he exactly looks for*", and another one from Batuli, "*How can I value it [classroom observations]? You know what, they [the SBLs] do not tell us what they do find out?*", exemplified the complaints regarding this issue.

The lack of feedback influenced teachers to come up with differing views concerning the motivation underlying the observation. Beatrice's statements such as, "*I am not sure what he [the Principal] exactly looks for when he walks around during class sessions*", exemplified opinions of other science teachers in this case-study school. Most likely, it was circumstances such as this that influenced some or many teachers to believe that the SBLs walked around to do nothing but to check whether, or not, the teaching process was happening. Batuli stated, "*I think they are just inspecting to see whether, or not, we [teachers] are complying with the agreed teaching schedules*".

Relying mainly on informal observations and failing to inform those they observed (i.e., teachers) about the intention of such approaches is a worrying finding. Likely, the SBLs hesitated to inform teachers about their intention to visit for the fear that teachers might

react defensively. This assumption seems reasonable given the fact that teachers in this case-study school to a similar extent as the LPS demonstrated norms of privacy, a problem which is detailed later in this chapter.

5.3.2.2. *Management of Adoption and implementation*

The SBLs were asked to describe how they helped their science teachers to adopt the 2005 Tanzanian ISCS Curriculum. The science-teachers were similarly invited to share their opinions about how the SBLs guided them to master the required implementation of this curriculum. This section provides the outcomes of these investigations.

5.3.2.2.1. *Teacher-involvement strategy*

Teacher empowerment appeared to be one strategy employed by the SBLs in this MPS. SBLs attempted to engage the science teachers both in considering solutions for the curriculum adoption concerns and in guiding others to adopt this new curriculum. The data analysis process revealed that the SBLs actively strived to create opportunities for teachers to share their opinions and understandings about what actions and/or how they had to implement them to achieve a reasonable transition. To attain this purpose, the SBLs employed the following three techniques: (i) convening regular discussions; (ii) seeking teachers' agreement; and, (iii) consulting resourceful teachers.

5.3.2.2.1.1. Regular meetings and discussions

Word frequency analysis using NVivo 11 revealed the recurrent use of the term 'meetings' in the participants' statements. To be precise, it was transcribed 11 times from five out of six participants. The use of meetings and/or pedagogical discussions seemed to be one of the primary strategies adopted by SBLs in this MPS to guarantee equivalence in the understanding of the vision of the 2005 Tanzanian ISCS Curriculum among the teaching staff. Some of these discussions exclusively involved same-subject teachers (i.e., departmental meetings), but others involved the entire school (i.e., general academic meetings).

In addition to providing information about "*any new directive from the Tanzanian Ministry of Education* [regarding the 2005 Tanzanian ISCS Curriculum]" as Bakari

stated, the SBLs in this case-study school used such occasions to discuss any challenges the teachers experienced in dealing with this curriculum. Bernard, the GAM, stated that they also used such academic meetings for reminding their colleagues to focus on the recommended implementation. Through such meetings, Bakari described that,

Mwanzoni na mwishoni mwa kila mhula, kwa kawaida huwa tunaanda vikao vya kitaaluma. Lengo kubwa huwaga ni kudiscuss na kushare kwa pamoja experience zetu, mwennendo wa ufundishaji. Kimsingi tunajadili mambo mengi ambayo yanaturudisha nyuma juhudi zetu za ufundishaji na kupanga mikakati ya namna ya kuboresha. Lakini pia tunakumbushana mambo mbalimbali. Ni vile tu kujaribu kukumbushana. (Bakari)

Translation:

At the beginning and end of each term, I organise a staff academic meeting here with the aim of bringing teachers together to share their experiences and discuss our progress. Basically, in these meetings we discuss many issues, particularly those impeding us from achieving successful implementation, and set ways to go forward. But we also remind each other about various issues regarding the required implementation practices. It is just an attempt to remind each other. (Bakari)

Discussions concerning implementation-related concerns with the science teachers attained useful outcomes in this case-study school. Apart from allowing the entire teaching staff to come together to consider issues, explore ideas, and establish the way to proceed with the implementation, further evidence suggested that such occasions helped the SBLs to nurture positive relationships and trust with, and among the, staff. There was evidence that meetings influenced those who tended to hide their ‘incompetence’ from colleagues to start to disclose them. Bakari stated:

Kuna baadi ya waalimu si rahisi wakufuate eti wakuambie kuwa wana shida Fulani, hasa kama shida yenyewe inahusu ‘incompetence’ ya ufundishaji....

Vikao vimetusaidia kubadili hii hali kwa kweli. Kutokana na baadi kuonekana kwenye vikao wako open wakielezea magumu Fulani wanayoyapata, tumeanza kuona na waalimu wa aina hiyo nao wanapata ujasiri wa kusema kuwa nao wanapata shida kama hizohizo madarasani. Ile hali ya kujifichaficha imeanza kupunguza. (Bakari)

Translation:

It is hard for some colleagues here to tell others that they have some concerns, particularly if it is about teaching-related incompetence.... These meetings have really helped us to change this situation. After seeing that some colleagues are disclosing their experience regarding how difficult they feel to implement this curriculum, many of those who tended to feel shy are now seen declaring that they also experience the same. Attitudes such as this have now started to disappear. (Bakari)

Generally, given that the issue of ‘staff discussions’ was transcribed 13 times in the data from three (3) participants (i.e., 3 out of 5 agreement), it became evident that the use of ‘discussions’ was one of the accepted strategies of sharing the vision of the 2005 Tanzanian ISCS Curriculum in this case-study school.

5.3.2.2.1.2. Seeking teachers’ agreement

Another intervention action that came up rather frequently in the data, which is related to the preceding theme, was the SBLs’ practice of seeking staff consensus on various decisions concerning the implementation of the 2005 Tanzanian ISCS Curriculum. Five (5) statements transcribed from three (3) teachers (Batuli, Bakari, and Bernard) demonstrated that the SBLs did not rely solely on their ‘formal authority’ to drive curriculum implementation, they also attempted to reach a common understanding with colleagues in their department regarding how the implementation should proceed. Bernard, the HoD, provided one example to illustrate this theme. He stated, “*When any issue is raised, we collect opinions until a consensus about how things should be done is*

reached”. Similar statements were also provided by the GAM (Bakari) and by Batuli. Bakari, for example, emphasised:

Jambo liapoibuliwa kwenye vikao, mjadala huwa ni wa sote. Kila mmoja huwa anatoa mawazo yake kuhusiana na kinachojadiliwa. Kama kinahusiana na ufundishaji, basi tunakusanya maoni na kuyajadili hadi tunafikia muafaka wa namna bora ya kukabiliana au kutatua jambo husika. (Bakari)

Translation:

When an issue is raised in a meeting, we all share the discussion. Everyone provides opinion about any raised concern. If it is regarding teaching, we collect such opinions until a consensus about how that issue could be effectively solved is reached. (Bakari)

Evidence regarding the issue of consensus was also authenticated in some of the reviewed documents. “*We have agreed that from now onwards we will be providing students with more hands-on-experience opportunities*” was part of the minutes from the previous end-of-term meeting. Another part of these minutes read, “*Every teacher should organise more practicals and experiments; should involve students during the lesson*”; and, “*The staff agreed that they should avoid teaching without using Teaching Aids*”.

The repeated use of phrases “*we have agreed*”, “*the staff agreed,*” and “*the teachers agreed*” in both the reviewed minutes and interviews was substantial evidence that the SBLs’ intervention behaviours in this case-study school to a great extent relied upon ‘consensus’ rather than the mere use of positional authority in influencing the adoption of the 2005 Tanzanian ISCS Curriculum. That is to say, the SBLs in this MPS not only spurred the participation of everyone in the discussion about the adoption of this new curriculum, but also provided them a considerable degree of autonomy to conceive means by which they addressed any challenges they encountered during its implementation.

5.3.2.2.2. *Consulting resource teachers*

The SBLs in this MPS tended to request that some specific teachers share or exchange their knowledge of this curriculum. Evidence regarding this theme emerged six times from the four participants: the two interviewed SBLs (the HoD and GAM) and the two participant teachers (agreement of 4 out of 5). The researcher interpreted this practice as another strategy of involving teachers to promote curriculum adoption within this MPS.

Fundamentally, rather than only telling colleagues in the department how they should solve their challenges, Bernard stated that they (the SBLs) tended to ask the entire staff the “*Who knows? Who has an idea?*” and “*Who can show us?*” kinds of questions to encourage colleagues to share experiences amongst themselves. Moreover, the SBLs preferred to request that the ‘resource teachers’ from within the staff carry out the task of providing transition-related guidance. The ‘resource teachers’ referred to here were those who had attended intensive training on the implementation of the 2005 Tanzanian ISCS Curriculum. One of the SBLs, Bakari, for instance, stated:

Sisi tumebahatika, baadhi ya staff wetu ni msaada, hasa mwalimu Bertha. Huyu mwenzetu alibahatika kupata mafunzo ya kutosha kuhusiana namna ya kufundisha kulingana na mtaala huu. Kwa hiyo tunawatumia mara kwa mara. Inapojitokeza sintofaham au mabishano kidogo ya namna ya kutumia mbinu fulani-fulani, huwa tunamwalika yeye au wenzake waokoe jahazi kwa kutupa uzoefu, tukiamini wao wana utaalamu Zaidi yetu. Na kusema ukweli, tunawashukuru, hakika wamekuwa ni msaada. Kupitia wao tumefaulu ku-solve changamoto nyingi tu hapa. (Bakari)

Translation:

We are lucky here. We have a very resourceful staff here, particularly teacher Bertha. This colleague attended intensive training on how to implement this curriculum. We, therefore, utilise them very regularly. Whenever a debate about this curriculum emerges, we invite them to guide us through. And to be honest, they are a good help. We have solved many misunderstandings using their support. (Bakari)

Bertha, one of the resource Science Teachers in this MPS, agreed that they were occasionally consulted by the SBLs. “Yes, it is true, sometimes. I remember one day he [the School Principal] requested me to teach my colleagues how to prepare the Lesson Plan to reflect the demands of this new curriculum. This thing seemed too tricky to many teachers here”. Based on this evidence, the researcher concluded that the SBLs utilised these experienced teachers as internal consultants to provide some technical assistance and advice regarding the adoption of this curriculum.

Although the SBLs demonstrated how colleagues outside the administration team could be utilised to guide others to get through some challenging situations, all teachers were not successfully persuaded to adopt this approach. Bertha stated, “But listen, I can stay the whole term without seeing anybody begging for my help. In fact, I am surprised when somebody approaches me [for a guidance]”. This implied that unless Bertha and colleagues of her quality were invited to share their experiences in the meetings, nothing much happened. On these grounds, the SBLs in this case-study school still had a task of fostering peer support among the teachers to guarantee more rapid adoption of the 2005 Tanzanian ISCS Curriculum.

5.3.2.2.3. Building collegiality

Even though most teachers in the science department were not fully conversant with the 2005 Tanzanian ISCS Curriculum, statements from the four participants (agreement of 4 out of 5) and document reviews showed that the SBLs in this MPS attempted to

encourage teachers to help one-another to understand this curriculum and to master the required implementation. Strategically, the SBLs enhanced collegiality both directly and indirectly in ways described in the following subsections.

5.3.2.2.3.1. Direct techniques

Direct ways of building collegiality were only ascertained from Bernard (the HoD). Just after the introduction of the 2005 Tanzanian ISCS Curriculum, “*the preparation of Lesson Plans*” Bernard stated, “*seemed challenging for most of us*”. The HoD initiated reflective dialogues about this issue, focusing on how they had to detail the suggested instructional practices in the new Lesson Plan structure. Bernard (the HoD) did not tell colleagues how they had to plan their lessons. Rather, he created circumstances for the members of his department to interchange their insights and experiences about it. Bernard supported his colleagues by what could be referred to as building a culture of collaborative planning, claiming:

Utayarishaji wa maandalio ni moja ya changamoto kubwa sana kwa sasa. Bado hakuna ‘uniformity’. Chukulia mfano wa assessment column, kila mmoja anaandika kivyake namna anvyoona. Ambacho mie najaribu kufanya katika hili ni kuchokoza discussion za mara kwa mara. Sio kwamba nawaambia wenzagu fanyeni hivi au vile. Hapana. Unajua nini; kilichopo ni kama vile kipofu anawaongoza vipofu wenzake. Bado nami pia najifunza. Ninavyofanya hivi lengo langu ni kutengeneza mazingira ya kusaidiana kuweka sawa jambo hili kwa kutumiana sisi kwa sisi nikiamini kati yetu kuna wanaojua. (Bernard)

Translation:

One of the challenging things here is about how to write Lesson Plans. There is still a lack of uniformity. Take an example of the assessment column; everybody does how s/he sees it. To solve this issue, what I often do is to initiate regular discussions about it. I do not just tell them like “do it this way”. (Smiles). No! You know what? It is something like the blind leading the blind. I still have many things to learn. Ideally, when I do it this way, I create an environment in which collaboratively we can solve this challenge and create uniformity. I believe that some of us know it better.
(Bernard)

The second direct technique through which the SBLs in this case-study school enhanced onsite collegial professional support was through what was termed as an “*exchange program*”. The review of documents revealed the presence of a Memorandum of Understanding between this case-school and another one in China, with an “*exchange of teaching experience*” between teachers from these two schools being one of the agreed issues. Most of the study participants acknowledged the worth of this strategy. “*This networking*”, Bertha, for example, stated, “*opened a window for many of us to master pedagogical skills that we did not master well during our university teacher-education*”. Such opinions echoed the GAM (Bakari) who claimed, “*We are happy learning new instructional skills from the very successful teachers from a very successful country. To be honest, this opportunity has helped many of us to advance our skills*”.

In this way, the SBLs supported their colleagues in the science department by providing them with an outlet to gain valuable insights, advice and allowed them, as the GAM stated, “*... to share best practices and success stories*”. Generally, this support was important because it most likely helped to inspire and motivate science teachers to keep continuing with the adoption.

5.3.2.2.3.2. Indirect technique

The SBLs enhanced collegiality by reducing their physical distance from the teachers and among teachers themselves. During the interviews, the SBLs described how they allocated the staff to offices and their reason for the style they opted. “*When arranging working space*”, the GAM (Bakari) said, “*the same-subject teachers are necessarily allocated in one office with their HoD*”. After the researcher questioned the GAM why they had opted for this arrangement, he described, “*We want them [teachers] to access convenient support from those [among themselves] who are experienced in their own [teaching] subjects*”. Such statements created the impression that the SBLs in this case-study school understood the value of nurturing collegiality during the change adoption process.

Although such practices may seem to limit interaction with teachers from other departments, Bernard, the HoD, was of the opinion that working in one office with the same subject teachers helped him to capture more information about the adoption progress than he could access if he worked from another office. “*I can access information from even the informal conversations that occur in our office*”, which, according to Bernard, evolved frequently as teachers were not worried by his presence. Bernard suggested that he was extra careful to ensure he remained very open and that he created no barriers in interacting with teachers, emphasising:

Ngoja nikuambie, waalimu wenzangu wako huru na mimi. Wana uhuru sana kwangu na hawaoni soni kunitaarifu chochote juu ya matatizo ya ufundishaji, kama wanakutana nayo. Nimejaribu kwa kiasi kikubwa kuondoa ‘gap’ kati yang una wao na maanisha hakuna kizuizi chochote kati yetu katika kupena taarifa na kusaidiana lolote kati yetu. Binafsi hayo ndo Maisha yetu nakuhakikishia. (Bernard)

Translation:

Let me tell you, teachers here are free to me. They are very free to me and they never shy away from informing me when they need something or when they encounter difficulties. I have created no gap from them. I mean there is no barrier in sharing and supporting each other between me and them. Honestly, that is our life here. (Bernard)

Developing a proximal and critical relationship with the teachers was also to some extent exhibited by the School Principal. Although the Principal was not interviewed, Beatrice described him as somebody who behaved in ways that reduced the distance between himself and teachers. Typifying statements from Beatrice included, “*The Principal interacts with us very well*” and “*It is like we are colleagues*”. Even though the Principal failed to provide teachers with a large part of the material support he was often requested, his interactive behaviour and the related attitude made the participant teachers feeling happy. All of them felt the principal was with them in their attempts at implementing the 2005 Tanzanian ISCS Curriculum. Beatrice insisted:

Well, ninachoweza kusema ni kwamba tunashirikiana naye. Mkuu wa shule anachangamana nasi bila shida. Ni kama vile mwalimu mwenzetu wa kawaida tu. Ni mara nyingi tu anakuja kwenye maofisi yetu, na akija huwaga napenda matani sana. Lakini sisemi kuwa amefaulu kushughulikia kiasi kikubwa cha matatizo tuliyomfikishia, la hasha, lakini walau anatusikiliza na kutupa hamasa. Kifupi ni kwamba huwa anatuuliza tunaendeleaje na ufundishaji na kutuomba tusikate tamaal licha ya mazingira yalivyo. Kwa ujumla, tunamuona ni mtu ambaye yuko nasi kwenye kuyatekeleza majukumu yetu. (Beatrice)

Translation:

Well, all I can say is that we work collaboratively with him. The School Principal interacts with us very well. It's like we are colleagues. He always comes to our office and jokes with us. I am not saying he helps us solve or provides us with all we demand from him. No, but at least he listens and encourages us. In short, he asks us how we are continuing with the implementation and encourages us not to despair despite the challenges. Generally, we feel being with him in this journey. (Beatrice)

These findings show that, by using this practice, the SBLs in this case-study school were succeeding in making the teachers feel they were not isolated, and this-simplified the communication between teachers and SBLs. Generally, the SBLs in this case-study school had ascertained that the proximity of support is an essential aspect of the transition guidance processes.

5.3.2.3. Unexpected theme

Different from the previous case-study school, there was only one unexpected theme in this case-study school. The detail of this theme is provided next.

5.3.2.3.1. Norms of privacy and/or mistrust

Analyses of transcripts uncovered the presence of norms of privacy and/or mistrust and similar attitudes among science teachers in this case-study school. There was evidence that teachers lacked readiness to disclose and confess their concerns in dealing with this new science curriculum. For example, while the SBLs attempted to inspect instruction using walkthrough observations, Bakari (the GAM) believed teachers did not like it. “*I wish to observe them [teachers], but you know (smiles), when I attempt to do it, the way they look at me tells me that they have a ‘Does it mean he does not trust me?’ kind of attitude*”. Therefore, even though the SBLs reminded teachers to keep informing their

leaders about any curriculum-adoption challenges they encountered, Bakari (the GAM) was of the view that most teachers opted to keep their concerns to themselves.

Similarly, these perceptions were echoed in the HoD's statement as he was explaining why they were not providing their teachers with the descriptive and self-explanatory written feedback, particularly after they inspected Lesson Plans and Schemes of Works. Bernard pointed out that this tendency was fuelled by the reason that "*our teachers are not happy about it*", and this was because, "*Most of them believe that detailed comments jeopardises their privacy*".

The presence of these norms was authenticated by Batuli and Beatrice. Beatrice stated that she never wanted to see the leaders talk about her implementation concerns in the presence of other staff members. "*I would be happy if such discussions are conducted in privacy*" (Beatrice). During the interview, Batuli echoed the same opinion where she argued, "*If discussions about whether, or not, I have pedagogical concerns were carried out in the one-to-one context, it would be easier for me to talk freely [regarding my experiences]*". According to Batuli, she found it hard to mention her concerns in the General Academic Meetings because most of such concerns were specific to the subject she was teaching and that she was not happy to "*exposing her concerns*" to teachers of different subjects.

Having noted thoughts such as these 10 times in the participants' accounts, and since such views were transcribed from four (4) participants (i.e., 4 out of 5 agreement), the researcher considered this theme to be substantial and worth reporting. It is possible that thoughts about privacy and/or mistrust were hampering the SBLs' change guidance processes.

5.3.3. Teachers' implementation of curriculum

Through interviews, observations and reviews of Lesson Plans and Schemes of Work, the researcher examined how participant science teachers in the MPS dealt with the approaches recommended for the 2005 Tanzanian ISCS Curriculum and which ones they thought they had mastered. The collected data were backwardly mapped to depict

the extent to which teachers dealt with the key components of this curriculum. The following sections detail the findings.

5.3.3.1. *Instructional planning*

The participant teachers used the Lesson Plan framework provided by the Tanzanian Ministry of Education to prepare their lessons. That notwithstanding, how some teachers planned their instructions did not reflect the recommended practice. Most of the participant science teachers specified their lesson objectives using such verbs as ‘to know’ and ‘to understand’ repeatedly. Verbs such as these are strictly discouraged in the implementation of this curriculum as they do not indicate the precise skills expected to be attained by students by the end of the lesson.

In addition, the analysis revealed the science teachers’ failure to use other than the recommended textbooks to decide the depth, nature; and, the sequence of content or lesson, and the activities for consolidating, and extending students’ learning. Beatrice stated, “*I do not think we are permitted to use books other than the ones [textbooks] specified by the Ministry*”. Participant teachers felt that such behaviour denoted faithfulness to the 2005 Tanzanian ISCS Curriculum.

5.3.3.2. *Presentation materials and environment*

Instructional processes using aids were repeatedly carried out in the classrooms. Charts, sketches, and similar artefacts illustrating scientific issues and processes were displayed on the science classroom walls. Teachers occasionally used laboratories to demonstrate scientific processes and concepts. During the research, outdoor instruction was observed only twice, and was carried out by Bertha alone.

Even when teachers taught less-abstract processes or concepts, they mainly relied on charts, photos, and illustrations. As Batali was teaching Classification of Living Things; for example, the researcher saw her using plant and animal pictures to facilitate students' learning, rather than taking her students outside the classroom to undertake the lesson activity using actual organisms. Essentially, the researcher noted this practice during the review of lesson plans of all participant science teachers. For example, a

review of Birgitta's Lessons Plans showed that the use of real materials only occurred twice during the period from 22nd July 2007 to 17th January 2018.

5.3.3.3. Instructional strategies and processes

The analysis revealed the frequent use of lecturing methods among the participant teachers. However, they did supplement lecturing with questioning, group discussion and demonstration. As a result of this mix of instructional strategies, the participant teachers felt that they succeeded to make their classes interactive and student-centred. Additional strategies such as field work, experimentation and other related activities were also, but only infrequently, employed by some teachers, though with a slight variation in how each of them was implementing her/his program. The following subsections highlight these variations together with the description of the Levels of Use and the related Innovation Configuration of the implementation.

5.3.3.3.1. Direct instructional processes

All teachers employed lecturing methods in their day-to-day instructional processes. Just after they introduced their lessons, descriptions of their teaching revealed that all of them spent a considerable amount of time to do what Birgitta stated in her Lesson Plans as *"the presentation of new knowledge"*. During this time, the main students' activity indicated in the Lesson Plans of most teachers was what Birgitta described as *"to listen and to take notes"*. The lesson observation revealed that many teachers tended to spend a longer time talking and writing notes on the blackboard, a behaviour which could be argued to have ended up limiting a large part of students' opportunity to contribute their conceptions on the subject. Beatrice provided some of the reasons for this tendency:

Chukulia unafundisha "electronic structure of matter". Kama ni mimi, concepts abstract kama hizi naanza nazo kwa kuchora namna zinavyoonekana na kuzielezea. Nadhan mtu ata-waste time tu kama ataanza kuwauliza wanafunzi kabla hata hajaelezea. Au we unaonaje? (Beatrice)

Translation:

Imagine you are teaching about the electronic structure of matter. As for me, I start teaching abstract concepts such as this by sketching how they look like [on the blackboard] and then explain them. I think you will waste your time if you ask students anything before explaining it first. What do you think? (Beatrice)

Batuli and Bertha also had the same view and provided statements to defend their choice of this instructional practice. Bertha, for example, reported, “*Lecturing helps me to consolidated scientific concepts using little time*”.

5.3.3.3.2. Questioning approach

The analysis revealed a regular use of a questioning strategy by all participant teachers. Review of their Lesson Plans provided the initial evidence for this approach. However, questioning was largely recorded at the beginning of the lesson, the lesson introduction stage. The key activity shown by all participant teachers at this stage reflected what was repeatedly described in Birgitta’s Lesson Plans as, “*asking [students] questions about the previous lesson*” or “*probing their [students’] preconceptions of the new topic*”. The participant science teachers’ accounts and the researcher’s observation of their teaching revealed that when the questioning strategy was employed at other stages of instruction, it was mainly for inquiring if students could make sense of the way lessons explained their life experiences. “*I usually question them [students] to know whether my lesson is understood, or not*” (Beatrice). Rarely did the teachers employed this strategy to check students’ ability to apply what was taught in the classroom, as this objective was seldom mentioned by all participants except Bertha.

Teachers employed mainly three questioning approaches in this case-study school. The first one was the ‘*volunteer response*’ questioning technique, and it was observed being used by all teachers. Typical evidence included Batuli’s statement, “*Students who think*

they know the answer or have an idea to my question normally lift their hands. What I often do, when this happens, is to select any of them to present her/his opinions". The second oral questioning technique involved the '*no hands up rule*', but this was used by only Bertha and Batuli. Descriptions of their instructions showed that they sometimes did not pick a student to respond to their questions because s/he raised her/his hand. Rather, they selected another student within the classroom. Bertha explained that she did it this way given that "*I know that some [students] may have the best ideas, but they hesitate to share them due to reasons known to themselves*".

The last questioning strategy employed is often described as the '*Pose, Pause, Pounce*' or '*incomplete basketball technique*'. That is, teachers tended to use this approach to capture students' ideas and responses, but without necessarily allowing anyone to build on the '*half-formed*' ideas provided previously by their peers. Beatrice insisted, "*after I ask something, I collect responses from different students, and in the end, I clarify and conclude which of the ideas were the most correct*". All of the participant science teachers indicated that they used this approach during their teaching.

5.3.3.3. Discussion approaches

All participant teachers reported fostering student-student classroom dialogues by using three discussion techniques: The '*buzzy grouping*', '*think-pair-share*', Jigsaw, and '*gallery walk*'. Of these strategies, buzzy grouping or small-group discussions was regularly used by all the interviewees. Evidence regarding the use of the think-pair-share strategy was only from Batuli and Bertha, while the occasional use of the jigsaw and gallery walk strategies were recorded only as being used by Bertha.

Participant teachers attempted to foster accountability of every student in learning, by asking them to show proof of what everyone had contributed to their group work. While describing her experience in using a Jigsaw approach, Bertha mentioned, "*What I do is to ask them [students] to divide the work, any work I give them. They should sit together and decide what everyone will contribute to it.*" Using this way, the participant teachers believed that students automatically shared the learning task.

5.3.3.3.4. *Demonstration approach*

Participant teachers' description of their instructional processes suggested that they all supplemented their lectures with demonstration. They stated that demonstrations were an alternative to conducting actual laboratory practicals, especially for grade levels that were not doing the National Examination and when they experienced lack of time and/or resources.

5.3.3.3.5. *Experimentation and hands-on teaching approach*

The participant science teachers attempted to provide students with authentic activities for them to experience scientific processes and learn how to apply various knowledge. Nevertheless, most participant teachers organised experiments only when they expected what they taught to appear in the final Tanzanian National Examination for the junior secondary school education. *"The situation does not allow us to organise experiments for each topic. Our attention is more to the topics that appear frequently in the [students'] final [Tanzanian National] Examinations"* (Batuli). Further evidence for this inference included the Lesson Plan reviews, from which the researcher recorded very few reports of the use of this strategy.

The actual session involving laboratory experiments was registered only once during the entire study period. This experiment was organised by Bertha in collaboration with another teacher and was about the concept of Phototropism. Students were tasked to keep seedlings at three different places, each with the source of light coming from its own direction, and to examine the growth of their shoots for two weeks, and then to write a report about their observations.

Simple activities, which dominated this instructional category, were organised regularly. Most of these, nevertheless, were restricted to the classroom environment. Some of the activities observed by the researcher included using hand lenses to observe parts of small flowers and the determination of the saturation point of salt and sugar in water. These were noted from the teaching sessions of Batuli and Beatrice respectively. The document review illustrated that even simple activities such as these were drawn from the textbooks. The outdoor inquiry activity was registered only once, and it was

undertaken by Bertha, during which students went outside the classroom to observe food-chain and food-web concepts and processes.

5.3.3.3.6. *Reflective teaching and learning strategy*

The participant teachers believed that some concepts were very common and that their learning did not necessitate using experiments or practicals. When they wanted to ascertain whether, or not, students could apply such concepts, Bertha stated, “*What we often do here is to ask them [students] to reflect and mention any process that ideally is applying what we have taught*”. Bertha continued stating, “*I employ this [strategy] to ascertain if students can use scientific descriptions to understand why and how various processes that they are experiencing in their lives are occurring*”. Having provided a similar account, Beatrice advised that they were essentially using this strategy because, “*... you know, the new Lesson Plan structure allotted a specific stage for this activity*”. An implication is that every teacher was using this strategy because they were mandated to do it by a specific stage in the Lesson Plan. Nevertheless, teachers were also using reflective practices in their teaching because, “*If you organise activities for each topic, trust me, you will not finish this syllabus*” (Beatrice) and “*By the way, where are the resources?*” (Bertha).

5.3.3.4. *Summary*

Table 9 summarises the implementation practice of the participant science teachers. The innovation configuration of the implementation for this case-study school was backwardly mapped from this table. Generally, there were variations in not only the number but also how the participants were employing the methods suggested for their implementation of the 2005 Tanzanian ISCS curriculum.

Teachers attempted to utilise the environment to enhance learning. However, they relied more on ready-made materials and, in particular, models and laboratory resources, than on improvising or selecting real ones from the surrounding environment. Even when they were teaching less-abstract concepts, they rarely made efforts to exploit nature to enhance the learning of some concepts and processes. On this ground, constructivist learning was not being practised.

Regarding student-centred and collaborative instructional processes, questioning and group discussion strategies were largely used to enhance lectures. Notwithstanding the fact that the participants revealed a rich variation and configuration in using these strategies, evidence of using graphic organisers, concept mapping and development of flow charts, which are similarly recommended for creating interactive instructions, were not observed. Even when trying to foster sharing and exchange of knowledge among students, teachers preferred discussion at the expense of debates and seminars, which are also recommended in the implementation of this curriculum.

Table 9**Summary of the Backwardly Mapped Configuration of Implementation of Curriculum components for the MPS**

Component		Teacher		
		1. Beatrice	2. Batuli	3. Bertha
Location of the lesson		- Presentation often done in the classroom - Used laboratory to demonstrate Chemistry concepts. Lab practicals were for confirming established facts	- In the classroom - Rare evidence of using laboratory was noted (Laboratory works were for confirming but not extending knowledge)	- Often in the classroom. - Outdoors session was noted twice, including the incidence of observing food chain/web concept in the surroundings. - Students were free to use laboratory.
Teaching aids and materials		- Often used charts, pictures & sketches - Rarely mentioned using real materials	- Often used charts, pictures and Models. - Occasionally used real materials	- Enhanced learning with charts, models and pictures. - Often enhanced instructions using real materials
Pedagogies	Direct instruction	- Spent more time describing because <i>"Chemistry is very abstract"</i> - Students voiced only when answering questions or allowed to discuss	- Batuli controlled pace and dialogue (<i>"I do not let them talk more due to lack of time"</i>). - Described more than gauging students' awareness of what she was teaching	She was the one who decided what to discuss, which activity to be done, when to ask questions etc. She was heard silencing students without asking what they were talking about (<i>"I need silence. Who is talking...?"</i>)
	Inquiry-based and student-centred instructions and activities	- Some questions demanded response to come from assigned activities - Students were activated to respond using No hands rule and incomplete basketball strategies	- Only oral questioning was revealed. - Encouraging students to respond was done using: - Volunteer technique - No hands rule	- Two-way questioning was noted, but with more questions from the teacher. Response were often orally. Students responded in writings only when assigned an activity. - Students were activated to respond using: - No hands rule; basketball and volunteer technique.
		- Group works noted but never assigned performance-based activity - Buzzy grouping was the only grouping strategy	- Group discussion - Think-Pair-Share - Buzzy grouping - Checked for accountability of every student	- Always used group discussion method. - Think-Pair-Share and buzzy group discussions - Groups were also created in performance-based activities - Fostered and checked for accountability of every student
		- Students assigned some activities (e.g., determining the saturation of water by dissolving salt) - Practicals and experiments but only for the grades seating for the National Exam - Reflective learning was the everyday strategy	- Enhanced lecturing with demonstration - Set common practicals/experiments - but not so often due to time and resource - Only to grade 11 and 12 students - Seldom tended to organise simple activities (e.g., using lenses to observe floral parts) - Engaged students in reflective practices	- One evidence of role play was noted. (Students acted how to prevent themselves from acquiring HIV) - Enhanced instructions with simple activities (e.g., <i>"...I went into the class with various foods and tasked students to categorise them..."</i>). - Guided students' experimentation (e.g., tropism) - Organised field observations (e.g., food chain/web) - Employed reflective practices in everyday instructions

NOTE: All the data about Birgitta's implementation practice were from document reviews. Thus, she was not included in this table

5.3.4. Teachers' Stages of Concerns

This Section presents findings regarding the Stages of Concerns (SoC) revealed by the science teachers in the Medium Performing School (MPS) in dealing with the 2005 Tanzanian ISCS Curriculum. As for the previous case-study school, illustration of the SoC Profile of each participant teacher and the related description is presented first. Then, the SoC Profiles of all of the participant science-teachers are amalgamated into the same figure, from which the case-study school's Stage of Concern (SoC) Profile will be interpreted by both tallying the number of participants who scored higher at each SoC level and by considering any similarity in shape of their SoC Profiles.

5.3.4.1. *Teacher Batuli's Stage of Concerns (SoC)*

Batuli's concern profile is illustrated in Figure 10. Batuli's highest levels of concern were at Stage 5-Collaboration and Stage 6-Refocussing. However, the tailing down of her Stage 6-Refocusing concerns may suggest that Batuli had no plans to implement the 2005 Tanzanian ISCS Curriculum differently from the recommended practices. Batuli appeared to be, nonetheless, beginning to think of better ways to deal with it given that the Stage 6-Refocusing concern was her second highest level of concern.

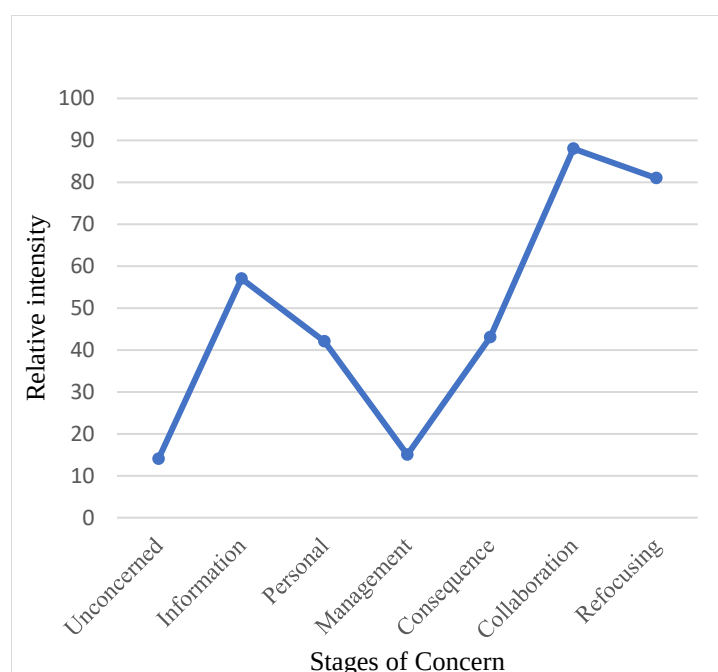


Figure 10. Concern profile of Teacher Batuli.

Batuli's third highest level of concern was at Stage 1-Information, which indicates that she was not very satisfied with the amount of information she was given concerning the 2005 Tanzanian ISCS Curriculum. Nevertheless, she appeared to be at ease with her awareness of the enactment of the curriculum (low Stage 0-Unconcerned concerns), and that she was satisfied with the logistic issues (low Stage 3-Management concerns) put in place for the implementation.

The interpretation of these three moderately intense concerns can be clarified by considering Batuli's background information. Batuli was inexperienced in the teaching profession. Her high Stage 5-Collaboration concern coupled with the moderately high Stage 1-Information concern might indicate that Batuli was looking to her colleagues for advice to improve her implementation of the 2005 Tanzanian ISCS Curriculum.

5.3.4.2. *Teacher Beatrice's Stages of Concerns (SoC)*

As illustrated in Figure 11, Beatrice demonstrated a high level of Stage 5-Collaboration concerns. Much of her thinking during that time was concerning finding opportunities to work with colleagues. Beatrice's next most intense concern was at Stage 6-Refocusing but with a gentle sloping-down tail, showing that she was most likely still implementing the 2005 Tanzanian ISCS Curriculum with some degree of 'fidelity'. She had a moderately high concern at Stage 1-Information related to this curriculum.

Moderate Stage 1-Information concerns coupled with the higher Stage 5-Collaboration and Stage 6-Refocusing concerns could imply that Beatrice wanted to learn from her colleagues about how to improve the implementation of this curriculum. This interpretation seems relevant given that Beatrice had not been intensively trained to deal with this curriculum. There is a likelihood, however, that her 18 years of experience in both teaching and with the previous curricula changes that occurred in Tanzania were driving a large part of her Stage 5-Collaboration concerns so that she could share with her colleagues her change-related transitioning experiences, challenges, success stories and other related insights.

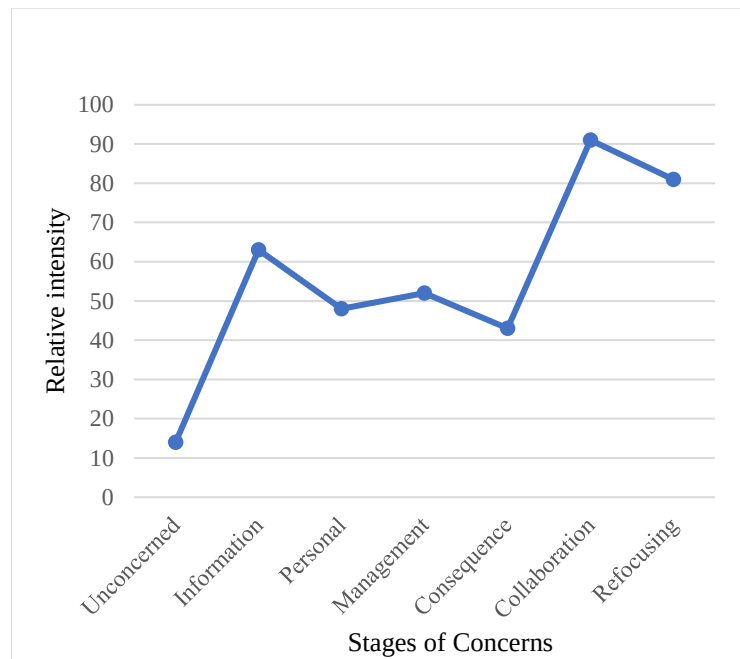


Figure 11. The SoC profile of Teacher Beatrice.

Beatrice appeared to be aware and interested in the curriculum changes as indicated by the low Stage 0-Unconcerned concerns. Moreover, she had managed to resolve a large part of the resistance-causing Stage 2-Personal concerns. Therefore, although teaching experience seemed to play a role in shaping her adoption of this curriculum, the SBLs should continue providing her with more support to reduce further her moderate Stage 3-Management concerns.

5.3.4.3. Teacher Bertha's Stages of Concern (SoC)

Bertha's SoC profile is illustrated in Figure 12. Bertha's most intense concern was at Stage 5-Collaboration, and this suggests that she was looking around for opportunities to collaborate with her peers in dealing with the new 2005 Tanzanian ISCS Curriculum. Closely following is the second most intense concern at Stage 4-Consequence, and this shows that Bertha was also concerned about how best to engage students in the learning process and in supporting them to learn.

Bertha was likely confident that she had skills to carry out the required implementation as indicated by the lowest concerns at Stage 2-Personal. However, she seemed to be still

looking around for some additional information concerning the 2005 Tanzanian ISCS curriculum as indicated by the moderate level of concern at Stage 1-Information.

Bertha's background complements this profile. As described previously in this Chapter, she was one of the intensively trained teachers in this case-study school. When Stage 1-Information concerns are considered together with the higher-level concerns at Stage 4-Consequence, Stage 5-Collaboration and Stage 6-Refocussing, it may suggest that Bertha was actively collaborating with her colleagues so that she could help them to learn how to maximise their impact on students whilst also developing ideas about how to improve the implementation of this new curriculum as indicated by the high Stage 6-Refocusing concern.

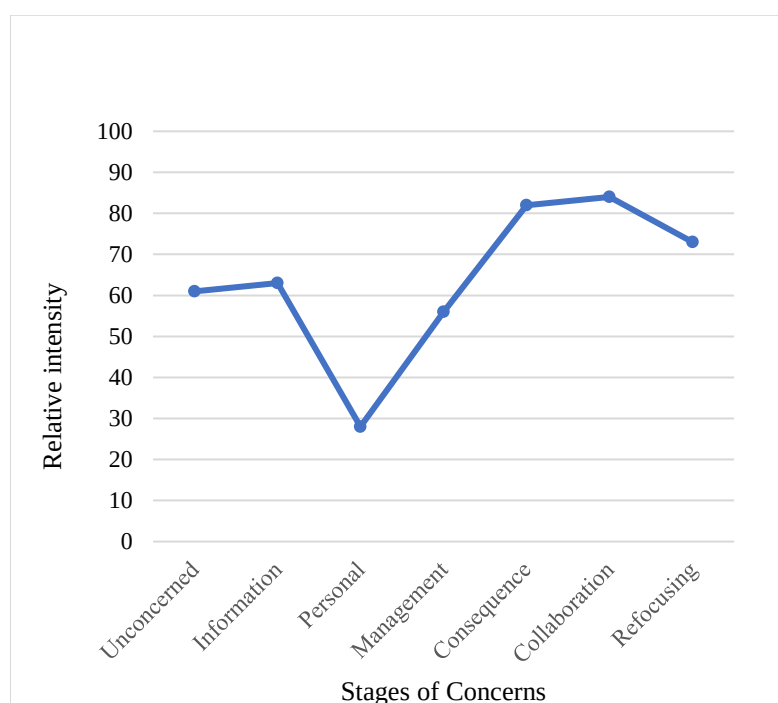


Figure 12. The SoC profile of Teacher Bertha.

Stage 1-Information concerns possibly emerged as moderately high because Bertha was actively searching for extra information, perhaps from the Ministry of Education or any higher authority, to improve her clarification of technical questions that were frequently being raised by her colleagues.

5.3.4.4. *Teacher Birgitta's Stages of Concern (SoC)*

Figure 13 summarises Birgitta's SoC profile. With a difference of only two percentiles in the intensities between Stage 3-Management and Stage 4-Consequence, one could infer that Birgitta illustrated a classical "two-humped" Concern Profile. The Stage 4-Consequence score was in the 82nd percentile, and this demonstrates that Birgitta had substantial worries regarding the likelihood of the 2005 Tanzanian ISCS Curriculum design and/or her own implementation attempts to bring about positive consequences for students.

The 80th percentile at Stage 3-Management illustrates that she was concerned about the logistics set in place to enhance the implementation. Most likely, Birgitta's reservations concerning the impacts of this curriculum was influenced by her perceptions of her poor teaching environment.

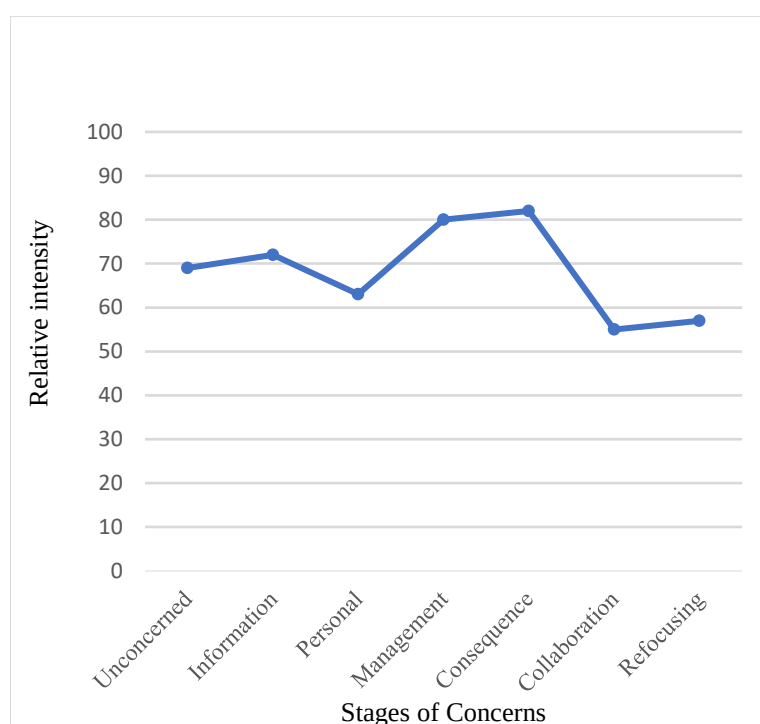


Figure 13. The SoC profile of teacher Birgitta.

Birgitta's next most intense concern was about Stage 1-Information about this curriculum, and her lowest concern was about Stage 5-Collaboration. That is to say,

while Birgitta may have wanted to learn more about this curriculum, she had not yet decided to start using her colleagues as a resource.

Birgitta did not attend any interview with the researcher because of the reasons described in Section 5.3.2. Therefore, the researcher lacked background information to complement his interpretation of Birgitta's SoC Profile.

5.3.4.5. *The Medium Performing School (MPS) SoC concern profile*

The individual-teacher's concern graphs are all amalgamated in Figure 14. This allows the description of the concern profiles for this school to be examined in two main ways: (i) based on the peak Stage of Concern scores and (ii) based on the overall shapes of the SoC graphs.

5.3.4.5.1. *Interpretation based on Peak Stage Score*

As Figure 14 shows clearly, three of the four participant science teachers (i.e., Batuli, Beatrice, and Bertha) had their highest concerns at Stage 5-Collaboration. That is to say, these three science teachers were most worried about working together to improve their implementation of the 2005 Tanzanian ISCS Curriculum.

The Stage 1-Information concern also appears to be relatively high in the four teachers' profiles but perhaps for different reasons. One could infer that these participant teachers desired additional information concerning the ways they should have implemented the 2005 Tanzanian ISCS Curriculum.

5.3.4.5.2. *Interpretations based on the shapes of SoC profiles*

Except for their variations at Stage 3-Management, Batuli, Bertha, and Beatrice show a very similar pattern in their profiles and with the highest level of concern at Stage 5-Collaboration for three of the teachers. Based on this, it could be argued that these three science teachers in this MPS worked as a team while the fourth teacher, the less experienced Birgitta, was still learning the ropes.

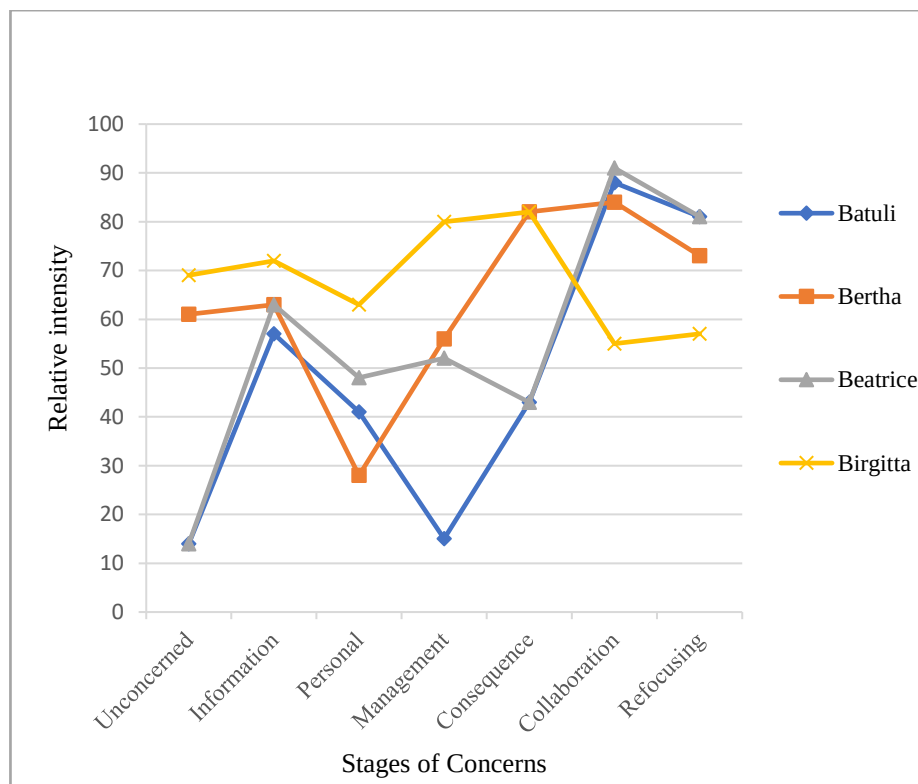


Figure 14. The MPS SoC profile.

5.3.5. Overall summary for the MPS

Findings illustrated the ways the SBLs in the MPS guided science-teachers' adoption of the 2005 Tanzanian ISCS Curriculum. Interviews allowed the researcher to infer the science teachers' configuration of their implementation of this curriculum. The trend of their concerns showed a great degree of similarity with peaks for three science teachers at Stage 5-Collaboration. The next major section presents findings obtained in the HPS.

5.4. Case-study school 3: The Higher Performing School

This Section presents the findings about the Higher Performing School (HPS). As with the previous two case-study schools, presentation of the findings starts with contextual information. Then, findings regarding the way SBLs guided the implementation of the 2005 Tanzanian ISCS Curriculum are presented. This section concludes with teachers' levels of adoption about, and their concerns with, this undertaking.

5.4.1. Context description

This case-study school was established in the 1950s by Religious Missionaries. It was handed over to the Tanzanian government nearly 50 years ago. The HPS is located not far from the town centre and is surrounded by its local town-community. Despite its location, the overall HPS-context was quiet and therefore conducive for both teaching and learning. The HPS had attractively organised buildings, and its grounds were well-maintained.

There were 22 classrooms and a well-furnished and richly resourced laboratory for each Science Subject. Students who attended the lower secondary school and those in the higher secondary school used separate laboratories. There were various posters on the laboratory walls, possibly to inspire students' inquisitiveness as well as promoting the growth of positive attitude concerning the sciences.

The School Principal's office and that of her assistants were in the same building. Each Head of Department had a personal office. Teachers occupied offices according to their teaching subjects. That is to say, only same-subject teachers shared one office.

5.4.1.1. *Population and staff organisation*

At the time of the study, this case-study school had approximately 500 students, both lower and higher-level secondary education students. There were 64 teachers in this case-study school, of which 22 taught science and mathematics (6 in Biology; 6 in Chemistry; 6 in Physics; and 4 in Mathematics). The number of students in the classroom did not exceed 45, which is recommended by the Tanzanian Government. Therefore, the classroom situation was good for the implementation of this curriculum. Figure 15 illustrates the typical situation of laboratory sessions at the HPS.



Figure 15. Students attending a laboratory practical session in the HPS.

(Photograph taken by the researcher in November 2017)

The School Principal had two (2) deputies: one for dealing with academic issues and the other for non-academic matters. The Deputy Principal (Academic) had four (4) other assistants, of which two (2) dealt with sciences (1 for the lower secondary school level and 1 for the higher secondary school level) while the other two (2) assistants dealt with art subjects following the same arrangement.

As appears to be common in Tanzanian schools, the GAM did not carry out the entire academic coordination responsibilities by himself: he worked in collaboration with the Heads of Departments (HoDs).

5.4.1.2. Description of participants

The researcher invited seven (7) staff members in this case-study school to take part in this study: the School Principal, the GAM who in this school was referred to as Assistant School Principal-Academic, the Head of the Science Department, and four (4) science teachers (2 Chemistry and 2 Biology teachers). All of the invitees, except the Principal, agreed to participate and persisted until the end of the study. Participants who provided data were ascribed pseudonyms.

The GAM was ascribed a pseudonym of Alex. At the time of his first employment, Alex had only a Diploma in Teaching, which he obtained after having attended two (2) years of preservice training in one of the Tanzanian Teacher Education Colleges. After some years, Alex enrolled at a university for four years to develop his career. At the time of the research, Alex had 12 years of experience in teaching, and he had spent all of them at this school. Alex was appointed to become the GAM in 2016. Therefore, even though Alex had good experience in teaching, his leadership experience was in the early stage of its development.

At the time of this study, the HoD, ascribed the pseudonym of Anna, had a degree in the teaching profession from a university. She specialised in the teaching of Chemistry and Biology subjects. She had never undertaken basic teacher-education course provided by teacher education colleges. Anna commenced teaching in 2008, started working in this HPS in 2012 and was appointed to lead the Science Department in 2015. Therefore, Anna had almost three (3) years of experience in the leadership position when this study was undertaken.

The third participant, Andrew, was a Chemistry Teacher who had eight (8) years of experience in teaching (i.e., he started teaching in 2009). Before joining the case-study school in 2014, he taught in a public school located in a different region. The second Chemistry Teacher, Asha, had nine years of experience in teaching. Asha has been at this case-study school since 2011. Asha did not attend any other Teacher preparation program other than a University Teacher Education program.

The fifth participant, a Biology Teacher, was assigned the pseudonym of Alice. At the time of this study, Alice had 10 years of experience in teaching, with this case-study school being her third appointment. At the time of this study, Alice had already worked for three (3) years at this case-study school. After she finished her secondary education, Alice enrolled in a University Teacher Education program without first attending a Teacher Education College. Alice had never undertaken any in-service training covering the implementation of the 2005 Tanzanian ISCS Curriculum.

The sixth and last participant teacher from this HPS was a Biology teacher ascribed the pseudonym of Amina. Amina started to work as a teacher in the late 1980s and had

come to this school in 2005. Having attended several intensive in-service professional learning workshops covering the 2005 Tanzanian ISCS Curriculum initiative, Amina was among the resource science teachers. She participated in the cascading of this 2005 Tanzanian ISCS Curriculum within the Region in which these three investigated school are located.

5.4.2. SBLs' leadership of curriculum adoption

Using the same set of interview questions as before, the study investigated how change leadership is carried out in this HPS. The following subsections present the findings for this case-study school regarding this question.

5.4.2.1. Monitoring classroom teaching

Findings about the ways in which the SBLs monitored teachers' adoption progress were similar to those reported for the previous case-study schools. The SBLs in this HPS adopted three key strategies to monitor science teachers' curriculum adoption progress, namely: questioning both teachers and students, inspection of teachers' documents and, observation.

5.4.2.1.1. Questioning teachers and students

Interviewing individual teachers about how they implemented the teaching process was the first strategy used by SBLs in this case-study school in order to gauge their progress of adopting the 2005 Tanzanian ISCS curriculum. Alex (GAM) and Anna (HoD) stated that they often initiated discussions with the teachers and asked them to describe how they continued with the implementation. To collect detailed information about it, Teacher Alice specified that SBLs repeatedly questioned teachers to mention topics, experiments, and practicals they had taught already. For example:

Hawa [viongozi] huwa wanatuuliza kama tumesha-cover syllabus au la. Pia ni vitu gani tumevifanya kuhusiana na ufundishaji, nini tunahitaji vitusaidie kuboresha ufundishaji, wanatuuliza navyo. Mara chache pia wanatuuliza kama zile practical na majaribio muhimu tushazifundisha au la. Na sisi tunapoulizwa hivi hatusiti kuwajibu, tunawambia 'straight'. (Alice)

Translation:

They [SBLs] tend to question us about how much we have covered the syllabuses. What things we have already done in terms of teaching and what things we are lacking, which we would like to have for better implementation. Occasionally, they also go further and question us about whether certain important experiments and practicals have been taught to students, or not. So, when questioned, we tell them straight. (Alice)

Amina, having provided the same description, added that the teachers often used such opportunities to inform the SBLs about the challenges they faced and the support they needed to improve their implementation of the 2005 Tanzanian ISCS Curriculum.

Essentially, all six (6) participants claimed that the SBLs employed this strategy (i.e., 6 out of 6 agreement) in monitoring the teachers' curriculum implementation in this case-study school. The coding process revealed further that the participants mentioned this strategy nine times and appeared to be the most frequently mentioned change-adoption monitoring strategy in this case-study school.

The participants also mentioned that the SBLs used students as their important sources of information regarding teachers' adoption of this curriculum. During the interview, Alex, for example, stated, "*We always question and ask them [students] to describe how they are taught in their classroom*". He was of the opinion that students did not hesitate to provide their views. Sometimes, the SBLs asked students to describe whether they liked their teachers' instructional processes, or not. "*We ask them [students]*", Anna, for example, stated, "*to appraise the degree to which they understand [their] teachers*".

Evidence concerning the use of student interviews in this case-study school was reinforced further by the information collected from both teachers and through field observation. For example, as Alice was answering the researcher's question, she stated:

Mara nyingi viongozi wanawaita wanafunzi na kuwahoji kwa siri kuhusu sisi. Wanawahoji vitu vingi, kwa mfano, kama tunakava syllabus, na hata kama tunawafundisha vizuri au la. (Alice)

Translation:

Leaders [SBLs] usually call one or few students and question them secretly about us. They question, for example, about how far we have covered the syllabus and about the way we actually teach them. (Alice)

The SBLs enabled students to provide their opinion in two additional alternative ways. The first way was by using what Alex and Anna called “*Class-Talks*”. These meetings, according to Alice, included students from a specific grade and one of the SBLs. Through such meetings, students provided their opinions regarding the tendency of the teaching processes, and specified if they were satisfied with these, or not. Teachers were not present at these meetings.

Another data collection method to elicit students’ reactions was with the use of Opinion Boxes. “*We also have opinion boxes here*”, Alex (the GAM) stated and emphasised, “*If you walk around you will see them*”. Alex specified that they designed such boxes for students to lodge their instruction-related appraisals and concerns anonymously and at their own convenience. Alex was of the view that these boxes were for students who felt worried to appraise their science teachers in the presence of others. Alex argued that this practice was already “*a well-institutionalised culture*” in this school to the extent that students provided their opinions at any time regardless of whether they were asked, or not, explaining:

Wanafunzi wanatumia hayo masanduku kutolea maoni kuhusiana na ufundishaji; na kimsingi, huwa wanayatumia kutolea maoni ya mambo mengi. Tuliamua kuweka masanduku haya maalumu kwa wanafunzi ambao tulidhani wangeweza kuwa na mashaka kutoa maoni yao kuhusiana na namna

wanavyofundishwa huko kwa njia za ana-kwa-ana. Kwa hiyo wanaweka maoni yao kwenye haya masanduku kwa muda wao bila ya ulazima wa wengine kujua. (Alex)

Translation:

In these boxes, students put their appraisals of the teaching; and in fact, they use these boxes to provide us their opinion concerning many other things here. These boxes are specifically for students who we thought would be uncomfortable to tell us on face-to-face about their teaching-related concerns. So, they put their written appraisals in these boxes not only secretly but also at their convenience. (Alex)

In summary, all six participants (i.e., 6 out of 6 agreement) mentioned that the SBLs tended to question teachers. 13 statements from all of the participants (i.e., 5 out of 6 agreement) mentioned that the SBLs tended to question students. The data indicated that questioning was the most frequently method used by the SBLs in this case-study school to collect information about teachers' adoption progress.

5.4.2.1.2. *Inspecting lesson plans and program documents*

Four participants (2 SBLs and 2 teachers) mentioned inspection of lesson plans and program documents as an additional strategy that was used in this case-study school to monitor both the rate and extent of curriculum adoption. The documents that the SBLs often also inspected to gauge the teachers' curriculum adoption progress included the Logbooks, Lesson Plans, and, Scheme of Works. Evidence revealed that the SBLs inspected Lesson Plans every Friday.

The focus of the SBLs' inspection of these documents was mainly on two things: “We look at the flow and sequencing of teaching process” (Anna) and “My further interest is in their use of supporting teaching resources” (Anna). The SBLs believed that it was easy to determine whether a science teacher had implemented the 2005 Tanzanian ISCS

Curriculum well by merely looking at these issues. However, some of the SBLs in this case-study school, particularly Alex, had a negative view about the effectiveness of this strategy. He stated that he inspected these documents only because it was part of his job descriptions, noting:

Mmi binafsi bwana siamini kama hizi [Lesson Plan, Logbook and Schemes or work] zinaweza kweli chanzo sahihi cha taarifa na ufundishaji. Nasema hivi nina maana. Kinachoandikwa kwenye Plan mar nyingi huwa kinatofautinana sana na kile kinachotokea darasani nakuhakikishia.... Binafsi sidhani kama mtu anaweza kujaji ubora wa ufundishaji kwa kuangalia lesson plan. (Alex)

Translation:

I do not think if these [Logbooks, Lesson Plans and Schemes of work] can be successfully used to determine how a teacher is faring with the implementation. Because, what a teacher plans always varies with what s/he does in the class.... I do not think you can use a lesson plan to judge a teacher's competences. (Alex)

Importantly, there was convincing evidence to suggest that the SBLs did not inspect teachers' Lesson Plans and other program records in an effective way. The feedback that they provided their teachers, for example, could not indicate whether teachers were exhibiting critical problems, or not. As they inspected these documents, the SBLs used comments that appeared unclear, less-descriptive, and less-guiding, including, “*This is not the right way*”; “*Competence-based lesson planning could be more effective*”; “*Improve it*”; “*Seen*”; and, “*Your lesson plan is incomplete*”. Appendix 15 illustrates such comments in red on the two selected pages of the Lesson Plans of Alice and Asha.

5.4.2.1.3. Walk-through observation

The analysis coded this strategy four (4) times (i.e., the frequency mentioned) from three research participants (i.e., 3 out of 6 agreement) in this HPS. Therefore, the

analysis ranked it the third in the list of regular change-monitoring strategies in this case-study school.

The common approach by which the SBLs observed the curriculum implementation was ‘walkthroughs’. They walked around and occasionally stood for few minutes observing how teachers carried out the implementation. The GAM (Alex) stated:

Mimi kama ‘academic’ mara kadhaa huwa napitapita madarasani huko kuzungukia kuona ufundishaji unavyoendelea. Kupitia mbinu hii Napata kufaham kama mambo yako sawa au la. (Alex)

Translation:

As the School Academic Master, I sometimes walk around to observe how a teacher is faring with the lesson. Through this I know whether there is a problem or not. (Alex)

Additionally, the HoD (Anna) specified that she also attempted to observe teachers as they prepared themselves to teach students. Anna was the only implementer of this strategy, likely because she shared the same office with teachers in her department. “As someone is preparing to enter a class, I observe how s/he does it, but without them knowing” (Anna). Anna specified that her primary focus in this undertaking was on the instructional aids that science teachers prepared and the time they spent to finish their preparation, noting:

Endapo naona mtu anajindaa kwa ‘style’ ileile kila siku, kwa mfano dhana au ‘materials’ na ‘teaching aid’ anazojiandaa kufundishia zikiwa zilezile za kuchora kwenye ‘manila paper’, mi ‘naconclude’ tu kuwa huyu hana jipya, mwendo ni uleule. (Anna)

Translation:

If one prepares her/himself in the same style. For example, if facilities, materials and teaching s/he prepares for instructions are the same such as those of drawing on Manila paper, I conclude that s/he has not changed. It is an indication that the business is as usual. (Anna)

However, the analysis noted an issue regarding the way the SBLs did walkthrough observations in this school. Three statements echoed part of Anna's account quoted earlier in this theme. Alice, for example, stated: "*Last year I was very surprised; I saw him [the School Principal] standing outside the classroom observing my presentation*". Such statements could suggest that the SBLs in this case-study school had no interest in notifying science teachers about their intention to visit classrooms for observations. Most likely, the level of trust among the staff influenced this SBLs' behaviour in this school.

5.4.2.2. Curriculum adoption guidance

This section provides details of the strategies employed by SBLs to institutionalise the 2005 Tanzanian ISCS Curriculum in this case-study school.

5.4.2.2.1. Teacher-involvement strategy

Involving teachers in considering solutions to change-related concerns emerged as one of the themes describing behaviours exhibited by the SBLs in guiding the transition. Evidence suggested that the SBLs in this HPS strived to create opportunities in which science teachers could share their visions of what/how to do to achieve a satisfactory realisation of the desired transition. Based on the researcher's sense-making of the data as well as through content analysis, meetings and discussions emerged to be the main involvement strategy in this case-study school. More importantly, the SBLs cherished staff consensus in such discussions.

5.4.2.2.1.1. Staff meetings and discussion

Word frequency analysis using NVivo 11 program revealed a repeated use of the two terms in the participants' descriptions: “*meeting*” and “*discussions*”. Further inquiry revealed that the SBLs used meetings as the intervention platform. Staff discussions appeared a prominent way in which SBLs and teachers shared experiences regarding adoption and implementation of the 2005 Tanzanian ISCS Curriculum.

According to the HoD, Anna, they used academic meetings to question teachers whether they had experienced challenges while teaching, or if they had not, and to ‘initiate discussions’ about how they could solve challenges they encountered. Anna explained:

Mara nyingine huwa tunaitisha vikao vya idara. Kwenye vikao hivi tunawauliza waalimu kusiana na maendeleo ya ufundishaji. Tunawauliza kama wana changamoto zozote kwenye kufundisha au la. Na nakuhakikishia kuwa wanasema. Huwa wanatuambia vitu kadhaa kama changamoto zao. (Anna)

Translation:

Sometimes we convene departmental meetings. In these meetings, we ask teachers to tell us how they proceed with the implementation and whether they encounter any challenge while teaching or not. I assure you that they do it. They tell us their challenges. (Anna)

5.4.2.2.1.2. Consensus

Seeking the ‘*agreement*’ of staff about various matters was the characteristic feature of the SBLs’ interventions in this case-study school. Data analysis revealed that the SBLs did not simply rush in to tell teachers how they had to solve implementation challenges. Rather, after collecting evidence about these issues, the SBLs convened discussions to seek the opinions of teachers themselves on how their teaching could be improved or conducted somewhat differently to attain the goals intended by the 2005 Tanzanian

ISCS Curriculum. The statements of the GAM (Alex) and that of Asha were selected to illustrate this theme, noting:

Hoja zinazoibuliwa na wanafunzi kuhusiana na namna mwalimu anavyofundisha huwa zinawasilishwa kwenye kikao cha staff. Kwenye kikao hiki, waalimu na sisi viongozi tunajadili kwa pamoja hoja hizo hadi makubaliano ya nini kinatakiwa na namna gani ufundishaji ufanyike yanafikiwa. (Alex)

Translation:

Concerns raised by students about teachers' ways of teaching are presented to the general staff meeting. Teachers and the leaders in this meeting discuss it until they agree about what or how teaching should be done to improve implementation. (Alex)

The view that the conception of solution seeking for the encountered implementation challenges was a buy-in process in this HPS was also noted from teachers. Participant teachers insisted that when there was information that they taught science in ways that did not reflect the 2005 Tanzanian ISCS Curriculum, the SBLs convened staff meetings or one-on-one discussion about it. In such discussions, the SBLs provided teachers with opportunities to explain what had influenced them to teach in ways that did not reflect the new curriculum demands and initiated negotiation on how to improve.

... na walimu husika pia anapewa nafasi yaya yeye kutolea ufafanuzi wa nini hasa kilipelekea afundishe kwa namna tofauti na mtala unavotaka, hasa zile njia zinazolalamikiwa na wanafunzi. Na majadiliano kama hayo huwaga yanaendelea hadi pale makubaliano ya maboresho yanayohitajika kuhusu ufundishaji yanapofikiwa. (Asha)

Translation:

... and a teacher in question is usually invited to explain what influenced her/him to teach in ways that do not reflect the curriculum demands, especially teaching methods complained by students. And such discussions often continue until we reach some kind of agreement about the required changes. (Asha)

The use of meetings and seeking agreement of colleagues in most pedagogical decisions indicated that the SBLs not only encouraged involvement of other staff-members in the consideration of change adoption, but also that they fostered trust and openness among the entire staff. Possibly, negotiations and norms of the give-and-take approach in such meetings and discussions helped to ensure that the vision of this innovation was shared equally among teachers in this HPS. Maintaining good communication and establishing trust between the SBLs and frontline teachers likely promoted commitment of their staff to the adoption of this 2005 Tanzanian ISCS Curriculum.

5.4.2.2.2. *Fostering collegiality*

To ensure rapid transformation of teachers' curriculum implementation practice, the SBLs in this HPS fostered the sharing of experiences and collegial reflection of their teaching. The SBLs cherished these practices to augment personal understanding of the 2005 Tanzanian ISCS Curriculum and to ensure a satisfactory speed was maintained in mastering the required implementation.

The SBLs in this school not only characterised themselves but were also recognised by teachers as advocates of team-teaching, peer-to-peer support and the related practices such as mentoring and coaching. The data revealed that the SBLs continuously advised same-subject teachers to meet semi-regularly to discuss, share experience, and to learn with, and from, each other about how to deal with this curriculum. To encourage

teachers to build a culture of supporting each other, the GAM (Alex); for example, stated,

Huwa tunawashauri waalimu wanaofundisha somo moja kugawana mada. Tunawaomba kila moja awe anachagua zile mada ambazo anadhani yuko vizuri nazo na baadae wafanye kitu kama 'peer mentoring'.... Na tumekuwa tukifanya hivyo hapa. (Alex)

Translation:

We often advise same-subject teachers to distribute and share subject-topics among themselves. We ask every one of them to choose topics s/he can teach comfortably and then to perform something like peer mentoring. And we have been doing it that way here. (Alex)

Alice described the GAM, Alex, as a colleague and that “*He always reminds us about team-work*”. Alex, according to Alice, was a good advocate of staff collaboration. He kept on reminding the HoDs to convene regular meetings to discuss and share issues and experiences related to the delivery of their science subjects.

Further evidence obtained from the participant teachers supported the SBLs’ claim that “*We are teamed up and this practice is one of the issues we remind our teachers very regularly*” (Anna, the HoD). For example, Asha, one of the participant Chemistry instructors, specified that whoever experienced a challenge in teaching something, s/he quickly sought help from one of her more knowledgeable colleagues in their science department. Asha claimed,

Badhi ya wenzetu wali-attend trainings kadhaa kuhusiana na competence-based curriculum. Trainings ninazozisema hapani zile zilizotolewa siku za mwanzo-mwanzo baada tu ya huu mtaala kutoka. Sisi kwenye idara yetu sanasana tunamtumia madam [Jina limeondolewa]. Mtu ukiwa na changamoto unamuona anakusaidia. (Asha)

Translation:

Some of our colleagues attended various trainings regarding competence-based curriculum. The training I am referring to here are those that were offered in the early days of this curriculum. Our department uses Madam [name removed] very much. If you face a challenge you seek a help from her. (Asha)

During the data collection, the researcher noted a typical peer observation and team-teaching event involving two science teachers. One teacher demonstrated a laboratory experiment to students while Asha sat at the back of the classroom observing. A large proportion of the students' challenging questions raised during this presentation were responded to by Asha. Further follow-up conducted by the researcher after the session revealed that the presenter of that lesson was less experienced in demonstrating such activities as he was only employee in the last two (2) years.

Nevertheless, participants suggested that team teaching, and peer-to-peer supporting practices were not successfully incorporated by all teachers. Data showed that it was only chemistry teachers who achieved satisfactory progress in practicing team teaching and peer support. *"I think Chemistry teachers are more advanced in this issue [teaching in teams] compared to the other departments in this school"* (Amina). During a separate interview, Anna, the HoD, expressed feelings of being proud of this achievement; and as such, she added,

Waalimu kutoka kwenye idara nyingine wanatutembelea kuja kujifunza namna tunavyofanya [kufundisha kwa kushirikiana]. Nakumbuka kikao cha mwisho wa muula uliopita, mkuu aliwaomba wakuu wa idara nyingine watafute namna ya kuja kujifunza kwetu.... (Anna)

Translation:

Teachers from other departments come to our department to learn how we do it [team teaching]. During the last staff-meeting, I remember the School Principal asked the Heads of other Departments to come to learn from us.
(Anna)

Given that not all science departments in this case-study school were practicing peer-peer sharing of their experiences, it could be argued that this case-study school was still at an early stage of building this culture of community of practice.

5.4.2.2.3. *Delegation in change leadership*

The SBLs in this HPS undertook several actions that illustrated collaborative leadership behaviours. These included ‘delegation’ and ‘hierarchical sequencing’ of intervention-related responsibilities.

The participants’ accounts indicated delegation of intervention responsibilities among the SBLs as they guided the implementation of the 2005 Tanzanian ISCS Curriculum. Each of the three SBLs seemed to carry out the intervention tasks with which s/he was familiar regarding this 2005 Tanzanian ISCS Curriculum. In that way, they offered each other an opportunity to interact with teachers in an orderly way. Statements provided by Anna (the HoD) as she responded to the researcher’s questions concerning methods she employed to find out whether, or not, teachers encountered challenges in their attempts to deal with this curriculum helped to demonstrate this point. Anna stated:

Wanafunzi vilevile huwa wanatutaarifu kama mwalim fulani hafundishi vizuri. Na mara nyingi wanamweleza mtaaluma. Kwa kuwa mie ndo ninayefanya kazi na hawa waalimu kwa ukaribu huku idarani, basi nami nataarifiwa. Mtaaluma huwa ananipa taarifa ya lolote aliloambiwa na wanafunzi ili mimi sasa niweze kufanya ufuatiliaji wa karibu. (Anna)

Translation:

Students also advise us if a teacher is not teaching well. Often, they report to the Academic Master. Given that I am the one working closely with the teachers, I am then informed about it. The Academic Master informs me of anything he is told by students for further and closer follow-up. (Anna)

Even though she was not asked to explain whether, or not, she was collaborating with other SBLs, her statement suggested that ‘delegation’ and ‘hierarchical sequencing’ of intervention processes took place in this case-study school. The opinion of Alex, the GAM, demonstrates this idea very well. Alex claimed:

Mara tu nikiambiwa kwamba mwalimu Fulani hafundishi vizuri, kitu cha kwanza ninachofanya huwa ni kuwasiliana na mkuu wake wa idara. Nawasiliana naye na kumuomba ashughulikie hilo suala. Mkuu wa idara huwa ana-discuss na mwalimu husika.... Lakini kama mkuu wa idara linamshinda, huwa natarifiwa ili nione cha kufanya. Na kama mie nami linakuwa juu ya uwezo wangu, huwa nam-consult mkuu wa shule ili naye aone namna ya kutukwamua hapo. Hivyo ndivyo huwa tunafanya kazi hapa. (Alex)

Translation:

Once I am informed that a teacher is not teaching well, the first thing I often do is to communicate with the Head of the respective department and ask him to deal with it. Heads of Departments then discuss with the teacher in question. But if the head of the department fails to handle a situation, I am informed so that I can intervene. If it is beyond my capability, I consult the Principal to see how he can help us to get through. That is how we work here. (Alex)

Statements from three (3) of the four (4) science teachers seemed to illustrate the same point, that is, intervention processes were carried out in a hierarchical manner, with those higher in the administration taking the responsibility only after they were requested by those positioned lower in the hierarchy. Asha, the participant chemistry teacher shared one illustrative incidence. During the previous term, Asha lacked some laboratory materials. She informed her HoD about it who, in turn, reported the issue to the School Principal for further support. After a few days, the administration provided Asha with what she had requested, and the practical activity was eventually conducted. Further illustration of this phenomenon could also be noted in the following excerpt selected from Amina's statements:

Kwa kawaida huwa kuna vikao vya idara. Kila mkuu wa idara anakusanya watu wake na kujadili 'issue' mbalimbali kuhusiana na changamoto, kwa mfano, zinazopelekea matokeo kushuka. Baada ya hapo, wakuu wa idara zote huwaga wana kikao chao pamoja na Academic Master. Kwa hiyo 'issues' zilizoibuliwa na waalimu kuhusiana na changamoto mbalimbali na namna kila idara ilivyojipanga kupambana nazo zinawasilishwa na kujadiliwa. Nadhan pia wanajadili namna ya kutusapoti (tabasamu). Mwisho wa siku, viongozi huwa wanaitisha kikao na kutuhusisha waalimu wote.... (Amina)

Translation:

Usually, there are departmental meetings. Every Head of Department meets with her/his teachers to discuss challenges that leads to, for example, poor performance. Thereafter, a meeting is convened to include heads of various departments and the General Academic Master. In this meeting, issues and challenges raised by teachers in each department and how each department has planned to solve them are reported. I think they discuss how to support us as well (she smiled). Finally, leaders convene another meeting involving us all. (Amina)

These practices were also authenticated through the researcher's observations. A typical illustrative example involved the Principal and the GAM (Alex). The Principal entered Alex's office while the researcher was having an interview with him. After seeing that Alex was undertaking the interview, the Principal decided to leave. However, she left a message she wanted to deliver, which was to remind Alex and ask him to communicate with the other HoDs to suggest names of teachers who they thought had to undertake a particular professional training opportunity they were invited previously.

Even from the start of the study, the Principal stated clearly that she entrusted a large part of the teaching-related monitoring responsibilities to Alex (the GAM). Despite withdrawing from participating in this study, the school principal mentioned that Alex was the right person to be engaged in a study such as this, and this because the day-to-day curriculum monitoring activity within the school was largely handled by him. This was another important evidence to validate the presence of delegation and hierarchical sequencing of intervention responsibilities among the SBLs in the HPS.

The analysis of the data revealed that the curriculum guidance process was not the responsibility of any one person. Rather, intervention responsibilities were shared among the Principal, the GAM and the HoD. The SBLs, in this regard, seemed to have recognised that none of them could provide successful intervention in the absence of the support of colleagues from within the school leadership team. In this regard, team-leadership appeared to be an important factor for the intervention process to succeed.

5.4.2.2.4. *Unexpected themes*

Two key themes unexpectedly emerged from the participants' statements. These are described in the following sections.

5.4.2.2.4.1. Intervention timing

Whether, or not, the intervention by the SBLs occurred continually and what influenced such tendency emerged as an issue in this case-study school. Collection of information about the implementation progress and discussion of ways to address any noted concern

either occurred at the end and start of each term or, immediately after students' National Examination results were known. That is to say, while teaching was in progress during a term, the SBLs rarely conducted instructional supervision activities. A typical statement to illustrate this issue was from Andrew, one of the chemistry teachers in this case-study school, who explained,

Kwa kawaida huwa viongozi wanaandaa vikao na kuongelea mambo kama hayo, na mara nyingi huwa wanaitisha vikao mara tu matokeo ya Mitihani ya Taifa yanapotoka.... Kusema ukweli, viongozi huwa wanatuambia hayo mabo, lakini kama nilivosema kwamba huwa ni baada ya matokeo kutangazwa. Kama si kupitia njia hiyo, huwa hamna kinachoendelea. (Andrew)

Translation:

Leaders [SBLs] often convene a meeting to talk about it [poor teaching], and they often do it after National Examination results are released. To be honest, leaders tell us about such issues, but it is only after the release of examination results. Otherwise, business goes as usual. (Andrew)

A similar comment was heard from Alice, the Biology teacher. As she was describing whether, or not, they were provided with any intervention-feedback, Alice stated, “We often hear our leaders talking about various [teaching-related] issues mainly when there is a staff discussion about students' results either at the end or beginning of the term”.

The frequency with which the SBLs inspected the science teachers' delivery documents was another authentication of this theme. The SBLs signed every time they inspected Lesson Plans and Schemes of Work. A careful assessment of the dates they had signed indicated that the SBLs carried out this exercise mainly in the first two weeks of each term, after which they conducted little or no inspection at all.

Therefore, while admitting through their statements that seeking information regarding the change-implementation progress was pertinent for them to design an intervention,

and that it was something required all the time, such an understanding was not made the rule through their actions. It could be argued that the SBLs were not assuming *a priori* that their intervention decisions required a continuous information-seeking process from all sources. Moreover, apart from scheduling meetings and specifying times for inspecting teachers' Lesson Plans, the SBLs seemed to lack a specific policy related to the change supervision in this case-study school.

5.4.2.2.4.2. Norms of privacy

Teachers in this case-study school demonstrated views that whatever one did in the classroom was a personal business. Evidence for this theme was based on both the SBLs' complaints as well as teachers' opinion regarding the way they perceived instructional supervision.

Basically, teachers not only disliked disclosing their incompetence to colleagues, but they also struggled to distance themselves from their SBLs. The best evidence regarding this argument was from Anna (the HoD), who said while smiling, *"I think what you are talking about [disclosing one's concerns] is perhaps the most difficult thing to be done by teachers here"*. Anna maintained that whenever they reminded colleagues to teach according to the recommended method, colleagues reacted by complaining about other things such as scarcity of resources, students' weaknesses, lacking enough time and, length of the curriculum to be covered. Anna believed that teachers used reasons such as these to *"hide their weaknesses concerning teaching"*.

Essentially, evidence regarding this norm was also noted from the teachers themselves. For example, Alice, the Biology teacher, regarded all observations as akin to 'spying' on somebody and was not happy about it. Alice specified that she would be happy if teachers were informed in advance before any inspection of how they taught students was to be conducted. One of the excerpts that reflected her argument was:

Ninachosema hapa simaanishi nachukia kiongozi kuni-observe. Hapana. Kitu ninachokipinga ni kufanya hiyo kitu kama vile unani-spy. Lakin kama unanitaarifu kabla hujaja kuni-observe, sinaga shida mie. (Alice)

Translation:

What I am saying is that I do not hate observation. No. All I am opposing is carrying out this exercise as if I am being spied. I am comfortable when I am informed about such visits in advance. (Alice)

Teachers' standards about classroom independence have never been positive during the implementation of innovations. There was evidence to suggest that such a perception influenced the way the SBLs monitored and assessed the teachers' adoption of the 2005 Tanzanian ISCS curriculum. The analysis revealed that the SBLs inspected curriculum implementation mainly by using undercover strategies. Anna, the HoD, stated that she had never conducted direct observations and that she had no plan to do it. According to Anna, this is because she did not want to disturb teachers. Although statements such as these, at the first glance, signalled high levels of trust, the reality was later revealed to be quite different. The researcher noted the presence of some mistrust among teachers and between them and their leaders in this school.

5.4.3. Teachers' level of adoption

Teachers' level of curriculum implementation was gauged by backwardly mapping the interviews concerning levels of use and their implementation configuration. Teachers' concerns about implementing the curriculum was measured by using the Stage of Concern Questionnaire (SoCQ). Results for these aspects in this HPS are detailed in this section.

5.4.3.1. Implementation of the curriculum

Coupled with observation and reviews of Lesson Plans and Schemes of Works, the researcher interviewed all of the participant science teachers about how they dealt with the recommended instructional practices and what they perceived was working well for them. The information from these sources of data was backwardly mapped to produce the "Level of Use" and "Innovation Configuration" of their implementation of the 2005

Tanzanian ISCS Curriculum in this case-study school. Detailed descriptions of these findings are presented below.

5.4.3.1.1. Lesson Planning

All of the four participant science teachers did their best to detail their implementation processes on the Lesson Plans and Schemes of Work. They specified well their lesson objectives and intended competences, which they drew from the relevant syllabuses.

Perhaps most importantly, there was evidence to suggest that teachers in this HPS did not follow prescriptions of the syllabus blindly. Amina stated, *“You know, everything is suggested in the syllabus and we are encouraged to use it. But, anyway, I am not following it like a bible or script”*. It could be said, on this ground, that these teachers used their experience to decide resources and activities to improve their instruction.

5.4.3.1.2. Presentation location, materials and facilities

To a certain extent, the participant teachers demonstrated awareness of the fact that the 2005 Tanzanian ISCS Curriculum places much emphasis on the presentation setting as well as the selection and use of teaching resources. These are specified in the following subsections.

5.4.3.1.2.1. The physical presentation environment

A large part of the teaching was carried out in the ordinary classrooms. Occasionally, Asha and Amina attempted to deliver their lessons in the laboratories. Of all participant teachers, the use of all real-life contexts was noted from Amina alone, especially from the way she described her teaching, insisting:

Nilipokuwa nafundisha mada ya “waste disposal”, kwa mfano, tulitembelea kwenye mto huu wa jirani. Tuna mto umepita hapo jirani. Niliwapeleka wanafunzi wakajionee namna ambavyo watu wanatupa takataka ndani ya huo mto. (Amina)

Translation:

When I was teaching about waste disposal, for example, we visited the river. We have a river not very far from here. I took students there to observe how people dispose waste in it. (Amina)

The science teachers' decisions about where to conduct their teaching varied based on the nature of the topic. Some science teachers stated, *"I use a laboratory when I want to demonstrate a scientific phenomenon"* (Asha). Others mentioned, *"As for me, I organise outdoor learning sessions if I want my students to see the relation of what I teach in the classroom and their surroundings"* (Anna). This could mean that the science teachers in this case-study school had an idea of the factors they had to consider in deciding the presentation location to meet with the demands of this curriculum.

5.4.3.1.2.2. Teaching aids, materials and facilities

The resources and teaching materials that the science teachers employed to support and enrich both their teaching and students' learning ranged from the real ones (e.g., real organisms) to photographs, charts, and drawings. However, Andrew and Alice tended to rely more heavily on manila-paper sketches and photographs than on concrete materials from the surrounding environment. Even when they presented lessons using projectors, these two participant science teachers rarely animated or simulated the various scientific phenomena and processes they presented. Amina and Asha attempted to employ actual materials to enrich their lesson instructions. Asha, exemplified her regular use of these materials through the following statement:

Mfano tu leo nilichukua beaker mbili, filter paper na maji yenye mchanga. Halafu nikawaambia wanafunzi watenganishe maji na mchanga. Walifanya. Mwanzoni nilidhan labda hawana idea yoyote lakini kutokana na walivyofanya, nikagundua wanafaham mambo mengi tu. Leo hata sikupata ugumu kufundisha kwa kuwa.... (Asha)

Translation:

Today, for example, I took two beakers, filter papers, and sandy water. Then, I asked the students to separate sand from water. Students did. At first, I thought they had no idea, but from the way they did, I discovered that they know the techniques. My task was easy because.... (Asha)

In a similar way, Amina insisted that she was trained how to improvise teaching aids to ensure that her subject is contextualised. She stated: *“I only use drawings and pictures when I feel that there is no way I can make use of our environment”*.

5.4.3.1.3. Implementation methods

There was evidence that the traditional (teacher-centred) teaching strategies occupied a large part of the participant science teachers' curriculum operational forms, with a slight variation in the way every teacher tried to approach each pedagogical component. The following subsections detail the noted practices.

5.4.3.1.3.1. Direct instruction

Three participant teachers (Asha, Andrew and Alice) from this case-study school tended to allocate more time at Stage 2 of the revised Tanzanian Lesson Plan, and the principal activity was lecturing. In his Lesson Plans, Andrew, for example, tended to allocate 35 to 40 out of the 80-minute session for what he often described as *“presenting the new knowledge”*, and the planned main activity for students was regularly *“to listen and take notes”*.

Teachers attempted to justify their behaviour in different ways, including this from Alice, *“If you allocate more time for them [students] to talk during the lesson, I assure you that you will never finish this syllabus”*. On this issue, most teachers stated, *“Let me tell you. I prefer them [students] to talk when I provide them questions for discussions”* (Andrew).

Alice and Andrew added that lecturing was unavoidable given that Chemistry topics were fundamentally abstract. Asha exemplified this latter reason with statements such as, *“I start by lecturing straight away, especially when I am sure that what I want to teach is something that they [students] are not aware of”*.

5.4.3.1.3.2. Questioning approach

Question-and-answer strategies were employed by all the participants throughout each lesson (4 out of 4 agreement). Largely, teachers questioned students about the previous lesson when they wanted to know if they remembered anything about it. When the new lesson was not so much related to the previous one, some participant science teachers stated, *“I question them to check if they have any idea of what the topic itself is about”* (Asha). Furthermore, teachers used this strategy to make students ready for the lesson to start, a point which was demonstrated by Andrew, when claiming that, *“oral questions help to make my students attentive and ready for the new lesson”*.

In terms of the questioning approach, all teachers (4 out of 4 agreement) preferred using oral questioning, and they liked students to respond in the same way. Alice and Andrew stated that they invited group-generated responses depending on the availability of time and nature of the topic itself. While no evidence of written assignments was ascertained during the actual presentation, teachers indicated that they used these activities in their Lesson Plans.

5.4.3.1.3.3. Discussion approach

All teachers fostered collaborative learning by structuring purposeful teacher-pupil and pupil-pupil talks through discussions and group work. Evidence regarding the use of these strategies initially emerged from the reviews of their Lesson Plans, from which statements such as, *“dividing students into groups for discussion”* (Asha) and *“guiding students to discuss...”* (Alice) were frequently captured. The repeated use of the term ‘discussion’ in the participant science teachers’ interview statements (as per NVivo 11 Word Frequency results) provided additional evidence for the common use of group work during their instruction.

Nevertheless, only two (2) grouping approaches were revealed: buzzy grouping and think-pair-share. The buzzy grouping approach was the main technique employed as illustrated by Andrew's announcement to his students, *"You know your groups. Now, I want you to discuss this question and each group will present their answer tomorrow"*. The prevalence of this grouping strategy was reinforced, in part, by the fact that students in each grade were already assigned to permanent groups consisting of, as Amina stated, *"not less than five [students]; normally seven"*.

5.4.3.1.3.4. Reflective learning strategy

All the teachers employed reflective instructional processes to foster students' learning. They often asked students to mention various situations, events and observations they experienced in their lives and what they had learned from them. A typical example was given by Alice who stated:

*Nakumbuka siku moja nilikuwa nafundisha kuhusiana na Osmosis.
Nikawauliza sababu zinazofanya viazi vilivyolowekwa kwenye chumvi vichukue
muda mrefu kuiva kulinganisha na vile ambavyo havijawekwa chumvi kabla.
Wanafunzi walinipa majibu mazuri sana. (Alice)*

Translation:

*I remember one day I was teaching about osmosis. I questioned them
[students] about the reason for the difference in the time it takes to fry
potatoes that were salted and those that were not. Students provided very
good answers. (Alice)*

Data indicated that teachers used this strategy for assessing mastery of the subject. Evidence regarding this inference included a typical statement such as, *"When students are able to mention examples of life processes that applies what I have taught them, it gives me confidence that they have mastered well my lesson"* (Asha). Additionally, the

researcher repeatedly heard teachers asking students to mention examples of processes that use the knowledge they have learned during their lesson.

5.4.3.1.3.5. Demonstration, modelling and role-play

Evidence regarding the use of these strategies was initially coded from the reviews of the Lesson Plans and Schemes of Work. In these documents, teachers indicated that they had planned to perform activities such as, “*to demonstrate the process of gaseous exchange in mammals*” (noted from the Lesson Plans of Alice) and “*to demonstrate the process of preparing $H_2(g)$ using Zinc and dilute HCl* ” (noted from Asha’s Scheme of Work). Additional evidence was from the observation data, including a “*pop sound*” test for Hydrogen (H_2) gas observed during one of Asha’s presentation.

While the two Chemistry teachers employed demonstration as a standalone strategy, there was evidence that the two Biology teachers supplemented it with modelling and role play. As Amina described how she once taught the topic of First Aid, for example, she stated that she started with demonstrating the process of supporting various victims of accidents, and “*Then, I requested one student to act as a snake-bite victim and his colleagues to show how they could handle such a person*”.

5.4.3.1.3.6. Experimentation and activity-based teaching

Occasionally, Amina and Asha organised experiments and simple real-life activities as part of their regular instructional processes. The typical example was assigning students an activity of separating sand from water that was organised by Asha in one of the Chemistry lessons. Amina stated, “*I regularly use experiments as a technique of consolidating knowledge and building competence among students*”. This implies that evidence-based instructions were given a consideration in their instructions.

The other two (2) teachers, Andrew and Alice, tended to organise experiments only to prepare their students for the National practical examinations. Alice exemplified this point by stating: “*Sometimes I organise practicals for students in Form 4 [Grade 12 students]. You know what? There are practicals which pop-up so often in their exams;*

so, *I must teach them*”. This may imply that the science students who were in different grades lacked opportunities to test theories and practice what they were being taught.

5.4.3.1.4. Summary of the level and configuration of implementation

Table 10, overleaf, summarises the backwardly mapped Innovation Configurations for each of the four teachers against each of the main components of the 2005 Tanzanian ISCS curriculum. While the participant science teachers used a range of recommended instructional strategies, it was clear that their implementation did not embody the full ‘operational form’.

While the inquiry, constructivist and learning-through-doing methods are, for example, recommended in this curriculum, problem-based learning, projects, creativity crafting, and other related strategies were not considered. It could, therefore, be inferred that the ‘controlled’ and ‘guided’ inquiries, in which teachers limit the resources to be utilised and the evidence to be collected by the students, were regularly employed at the expense of ‘free inquiry’, which could have allowed students to expand knowledge or make discoveries in free, flexible and adaptive ways.

Similarly, even though participants seemed to be aware of the importance of using student-centred and collaborative methods, these were essentially realised by using oral questioning and group-discussion methods alone. Strategies and methods such as concept mapping, teamwork and group presentations that emphasise accountability of each student were not part of the main operational scheme. On these grounds, it could be concluded that the participants tried to focus on each domain, but many of them relied more on traditional techniques. The question of how they were dealing with each specific component depicted a weak configuration of implementation.

Table 10***The Backwardly Mapped Configuration of Implementation of Curriculum components for the HPS***

Component	Alice	Asha	Amina	Andrew
Environment and location	• In the traditional classroom and • occasionally in the laboratory	• In the traditional classroom and • occasionally in the laboratory	• In the classroom, • in the laboratory and • outdoor learning sessions	• Mainly in the classroom • Occasionally in the laboratory
Teaching aids and materials	• Drew pictures or illustrations on the Manila paper and on the chalkboard. • Brought models for presentations	• Illustrated on the manila paper/chalkboard • Tended to bring simple laboratory materials for demonstration	• Illustrated on manila paper • Brought real things for demonstration and for students to practice • Specimens of real organisms used	• Nothing than Illustrating Chemistry concepts and formulas on the manila paper/chalkboard was noted
Direct instructional strategies	• Often spent more instructional time describing concepts and processes to students	• she spent more time describing concepts and processes than letting students say anything	• Lecturing used but, in most cases, students were encouraged to ask questions or share their understanding	• Students talked only when allowed to ask questions. Thus, Andrew tended to dominate
Inquiry based, Collaborative and students centred strategies	• Used group discussions: ○ buzzy grouping style ○ Talk partner	• Students assigned group works. Only buzzy grouping style was noted	• Students assigned group works using: ○ Buzzy grouping style ○ Think-Pair-Share style	• He occasionally assigned buzzy group activities.
	• To check students' preconceptions; what	• To gauge students' preconceptions and to	• To check students' preconceptions, what they remember about the previous lesson, to assess	• To gauge students' preconceptions, assess

	they remember about the previous lesson; and to assess learning progress, she regularly used: ○ Oral questioning	assess learning progress, and to encourage constructive thinking, she regularly used: ○ Oral questioning ○ brainstorming technique	learning progress; and, to gauge students' thinking, she regularly employed: ○ Oral questioning strategy ○ Brainstorming strategy ○ Occasionally used concept mapping strategy	learning progress, he only employed: ○ Oral questioning strategy
	• To describe and show Biological processes, she coupled demonstration with modelling	• To describe and show Chemistry processes simultaneously, she employed demonstration strategy (e.g., pop sound test of H₂ (g))	• To describe and show Biological processes and phenomena, she occasionally coupled demonstration with modelling	• He said he occasionally demonstrated Chemistry phenomena and processes
	• To couch skills or foster metacognition: ○ She organised experiments but ONLY WHEN preparing students for National exams. • She used reflective learning practices and questions to gauge students' ability to relate knowledge and practice	• To couch skills or foster metacognition attitude: ○ She organised experiments ○ She organised practical activities. • She used reflective learning practices to gauge students' ability to relate knowledge and practice	• To coach skills or foster metacognition attitude, she organised: ○ Outdoor hands-on-activities ○ Study tours/ site specific visits (e.g., visiting the nearby river to see pollution caused by improper waste disposal practices) ○ Role play (e.g., helping snake bite victim) ○ Practicals and/or experiments • To assess students' ability to apply the knowledge, she used reflective learning practices and questions	• To couch skills or foster metacognition attitude: ○ She organised experiments but ONLY WHEN preparing students for National examinations • He used reflective learning practices and questions to gauge students' ability to relate knowledge and the real life-practices

5.4.3.2. *Teachers' concerns about the curriculum*

This section presents findings regarding the HPS participant science teachers' Stages of Concern (SoC) in dealing with the 2005 Tanzanian ISCS Curriculum. The Section starts with the depiction of the SoC Profile of each participant science teacher. Then, the concern profiles of all science teachers are displayed concurrently on one figure to allow for the overall HPS profile to be construed by comparing similarities in the shapes and trends of SoC of each science teacher's SoC graph. Some conclusions about the overall state of affairs in the Science Department in this HPS will be determined by tallying up how many of the participant science teachers in this case-study school had their peak scores at each Stage of Concern. Averaging the science teachers' concern scores at each stage to produce a single profile often leads to loss of information as extreme scores tend to influence the results and thus, obscures the reality in a particular science department.

5.4.3.2.1. *Individual SoC profiles*

This subsection presents the specific concern profiles of each of the four (4) science teachers (two in Biology and two in Chemistry) who were invited to respond to the SoC questionnaire in this HPS.

5.4.3.2.1.1. Teacher Amina

Figure 16 shows that Teacher Amina has a peak at the Stage 5-Collaboration level. Scoring so intensely at this Stage suggests that Amina was, at the time of this study, extremely interested in finding out how to cooperate with colleagues and learn with, and from, them about the 2005 Tanzanian ISCS Curriculum. Her secondary concern was at Stage 6 (Refocusing), but with the profile tail pointing down. The implication here could be that Amina was also developing an interest in modifying the teaching approaches suggested in the 2005 Tanzanian ISCS curriculum but in ways that were not critical of it.

Scoring highest at Stage 5-Collaboration seems to reflect Amina's experience with this curriculum. As she was among the few teachers who attended in-service training covering this curriculum introduction at the HPS case-study school, Amina was

often consulted for guidance by her colleagues on various teaching aspects, including how to run Biology practicals and experiments in ways that the 2005 Tanzanian ISCS Curriculum emphasises.

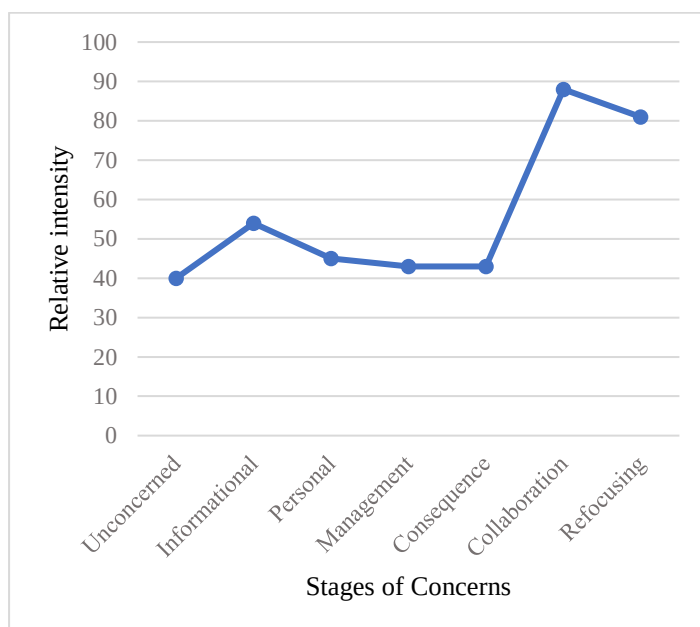


Figure 16. Concern profile of Teacher Amina.

Notwithstanding Amina’s interests in Collaboration and Refocussing, she was still seeking additional information covering the 2005 Tanzanian ISCS Curriculum as illustrated by the lower level peak at Stage 1-Information. The high Collaboration and Refocusing concerns followed by the slightly elevated Information concerns could indicate that Amina was looking around to find out whether, or not, any extra information was available to be considered before she would start altering the implementation suggested in the 2005 Tanzanian ISCS Curriculum. Thus, a small amount of extra information may be required to clear Amina’s remaining worries and turn her into one of the ideal implementers of the 2005 Tanzanian ISCS Curriculum in this case-study school.

5.4.3.2.1.2. Teacher Alice

As illustrated in Figure 17 Alice, the second Biology teacher, demonstrated a classic ‘two-humped’ SoC profile, with the same level of intensity (97th percentiles) of

concerns in the Stage 1-Information and Stage 5-Collaboration. One interpretation from this profile is that Amina simultaneously desired two things for her to be able to continue with the implementation process, viz.:

- (i). additional information regarding the 2005 Tanzanian ISCS Curriculum; and,
- (ii). collaboration with colleagues so that he could learn from them about how to deal with it.

She demonstrated the lowest level of concern at Stage 3-Management. This score suggests that she was not concerned at this time with the logistics, time, and resources in place for the implementation and may have been motivating her to engage in the implementation of the 2005 Tanzanian ISCS Curriculum.

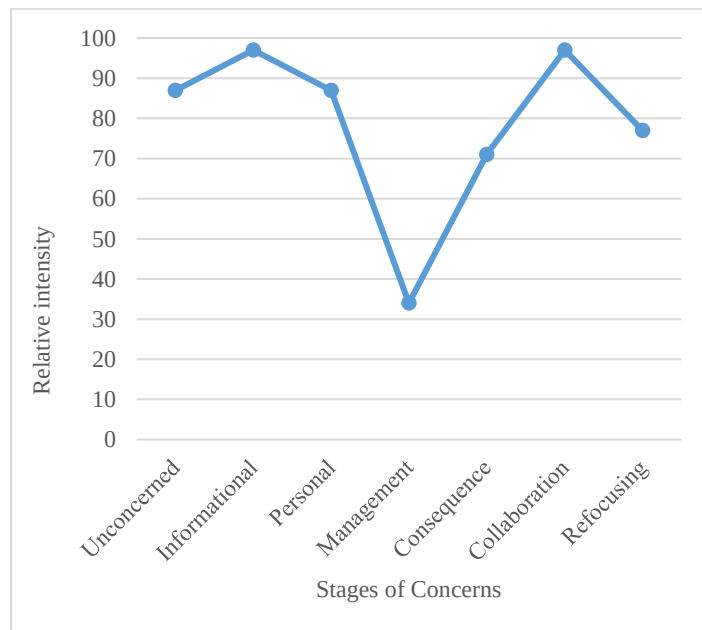


Figure 17. Concern profile of Teacher Alice.

Another interpretation of this two-humped profile is that Alice was at a very early stage of adoption at the time she completed the SoC questionnaire. Alice's 87th percentile scores on both the Stage 0-Awareness and Stage 2-Personal concerns may

indicate this early adoption phase. This interpretation is further strengthened by coupling her 97th percentile concern on the Stage 1-Information seeking with the 87th percentiles on both Stage 0-Awareness and Stage 2-Personal concerns. As such, her interests in working with colleagues in her department (indicated by the 97th percentile at Stage 5-Collaboration) was for the purpose of sharpening her understanding of this innovation. The validity of this latter interpretation is quite likely given the fact that Alice had not attended any in-service professional training covering the implementation of this curriculum. If this later interpretation is correct, then providing her with additional information concerning this curriculum would be the best approach to advancing her adoption of this new curriculum.

5.4.3.2.1.3. Teacher Andrew

Figure 18 illustrates Andrew's concern profile. Andrew demonstrated a slightly different two-humped concern profile compared with Alice. His primary concern was at Stage 1-Information and the second at Stage 3-Management. Such a two-humped concern profile implies that Andrew was seeking some extra information regarding what to do with the 2005 Tanzanian ISCS Curriculum and was also concerned about whether, or not, the provided logistics would make his implementation endeavours both smooth and successful.

According to the profile, Andrew also exhibited relatively strong Stage 2-Personal and Stage 5-Collaboration concerns and relatively low concerns at Stage 4-Consequence for the impact of this curriculum on students. He also has low levels of concern in thinking about alternative ideas that compete with the approaches recommended to be used in implementing the 2005 Tanzanian ISCS Curriculum as indicated by his lowest score at Stage 6-Refocussing.

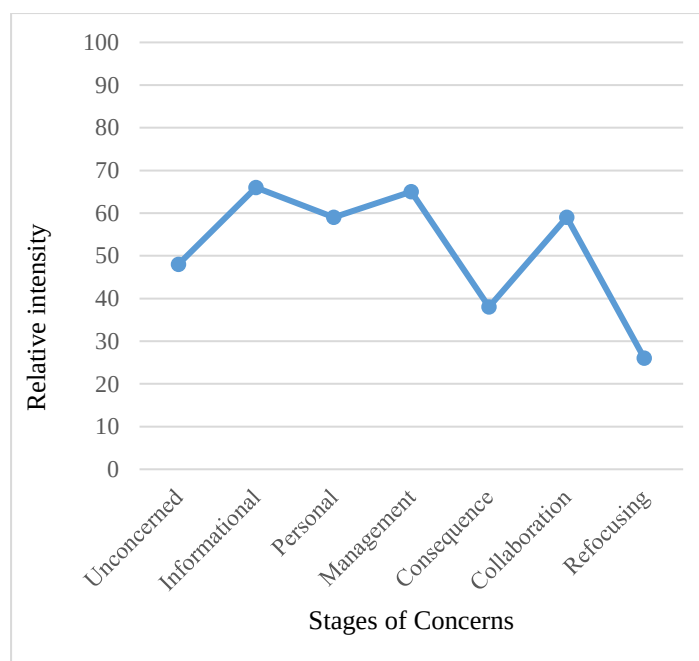


Figure 18. Concern profile of Teacher Andrew.

Andrew complained during the interview that he lacked both enough time for the implementation (Stage 3-Management) and that he was not given any opportunity to attend in-service training (Stage 1-Information) covering the 2005 Tanzanian ISCS Curriculum. On such grounds, a relatively high-level interest in Collaboration (Stage 5-Collaboration) could mean that he had to use colleagues as sources of information and learn from them concerning the details of this curriculum as well as how to deal with his own perceived capacities (Stage 2-Personal).

5.4.3.2.1.4. Teacher Asha

The concern profile of Asha is displayed in Figure 19. At the time of this study, her highest level of concern was at Stage 5-Collaboration, which indicates that she was thinking most intensely about whether she could learn with, and from, her colleagues about the implementation of the 2005 Tanzanian ISCS Curriculum. In addition, Asha demonstrated equal levels of intense concerns at Stage 4-Consequence and Stage 6-Refocusing. This could imply that her thoughts at this time were on how to maximise the impact of this curriculum and possibly of her own implementation practices on students. But since the Stage 6 Concerns tailed down, it could mean that Asha was

not yet thinking about replacing the suggested teaching strategies. All she was interested in was, instead, to make sure that she was doing the best things for the students in her classroom.

When the secondary peaks of Stage 4-Consequence and Stage 6-Refocusing are considered concurrently with the primary peak at Stage 5-Collaboration, and given that she had no concerns at all about the Stage 3-Management issues, it is reasonable to conclude that Asha wanted to work with others to maximise her impact upon students.

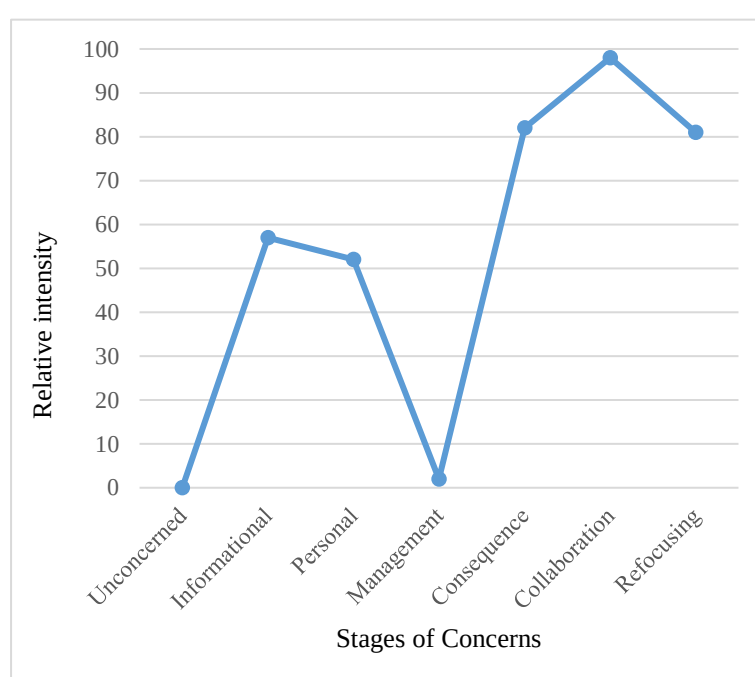


Figure 19. Concern profile of Teacher Asha.

Despite this conclusion, her Stage 1-Information and Stage 2-Personal concerns were not at their lowest level. Asha lacked enough confidence in her own capacity to deal with this curriculum likely because of her perceived lack of enough information concerning this curriculum. On these grounds, one may conclude that the main issue that was pulling Asha back from becoming an ‘ideal’ implementer was this relatively high Stage 1-Information concern. Therefore, in order to turn her into one of the best

users, SBLs should provide her the additional information she perceived she required.

5.4.3.2.2. Overall SoC Profile of the HPS

The concern profiles of all participants are presented in Figure 20. This allows an examination of any similarities in the peaks and valleys of the concern profiles of the HPS science teachers.

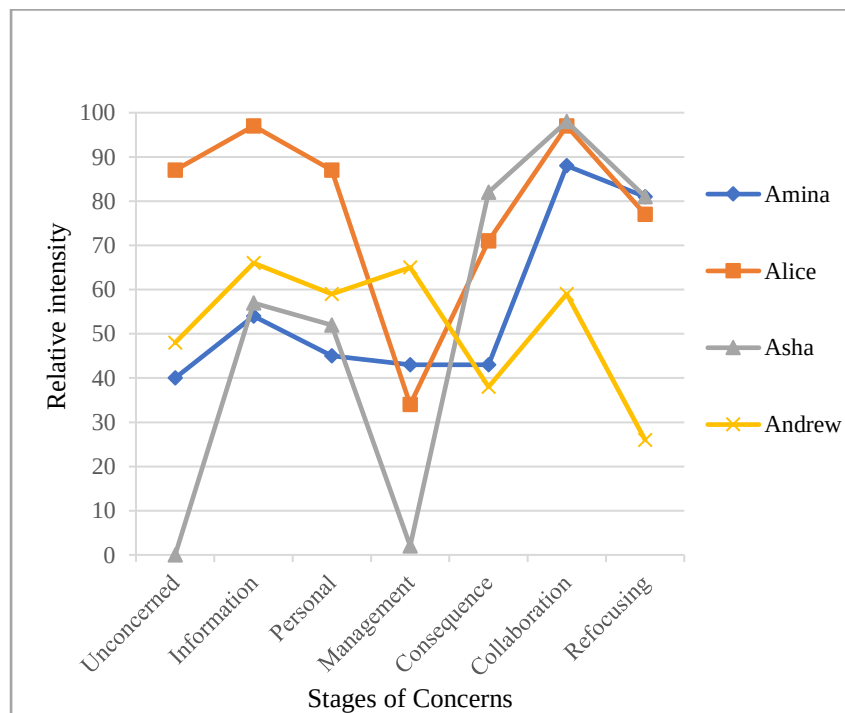


Figure 20. The Higher Performing Case-study School's SoC Profile.

5.4.3.2.2.1. Primary concerns

Based on the fact that three teachers (Amina, Asha, and Alice) demonstrated higher intensities of concerns at Stage 5-Collaboration, it is apparent that team-working was the primary issue in this case school. In fact, the same concern was also relatively high (59th percentiles) for Andrew. This result implies that teachers in this case-study school had a high interest in working together, learning with, and from, each other, but perhaps to attain different purposes. For Asha and Alice, who had relatively high Stage 4-Consequence concerns, their high interest in Stage 5-Collaboration was

likely aimed at maximising the impacts of their implementation of the curriculum on students. For Amina and Andrew, who had relatively low Stage 4-Consequence-level concerns, demonstrating these concerns may mean different things in consideration of their professional backgrounds. Amina had been guiding colleagues to implement this curriculum after attending in-service training regarding it. Therefore, displaying low levels of Stage 4-Consequence concerns could mean that she had already dealt with her impact concerns on students. In contrast, the fact that Andrew was nearly new to this curriculum could mean that he had not yet started to consider the impact of this new curriculum upon students' learning.

To a large extent, the broad high level of concern at the Stage 5-Collaboration level reflects participants' interview statements. During the interviews, many participants mentioned 'teamwork' as not only being emphasised by their SBLs in this HPS but also as something practised by the teachers, with Chemistry teachers indicating that they had achieved a great deal on this aspect.

5.4.3.2.2.2. Secondary Concerns

Based on Figure 20, it could be inferred that Stage 1-Information seeking concern was secondary in this case-study school. While it was one of the two most intense concerns for Alice and Andrew, it was the third most intense concern for Asha and Amina. This result indicates that the science teachers in this case-study school were, to some extent, not satisfied with what they knew about the 2005 Tanzanian ISCS Curriculum. This reflected the complaints raised by most science teachers during the interviews insofar as most of them were neither engaged in bringing about this change nor trained to implement it. That is to say, the science teachers in this HPS required more information about this curriculum.

5.4.3.2.2.3. General impression

In addition to these primary and secondary concerns, three additional issues could be noted from Figure 5. First, all four teachers in this case-study school were interested in the design of the 2005 Tanzanian ISCS Curriculum and, that they had not yet developed, or expressed, any intentions to alter or change it in any way as indicated

by the tail-down nature of their profile at Stage 6-Refocusing. Second, all of them indicated lower Stage 2-Personal concerns compared to their Stage 1-Information concerns, which may mean that they had few reservations about their abilities to implement this curriculum as recommended by the designers. Finally, the pattern of teachers' concerns as shown by the shapes of the graphs, especially from Stage 3 to Stage 6, were broadly similar and probably reflect the extent to which "teamwork" was both valued and being practiced in the school.

Such a general agreement in the pattern of concerns could mean that the science teachers in this school were progressing together in adopting the 2005 Tanzanian ISCS Curriculum. These results are strong evidence that collaboration among the science teachers was occurring in this case-study school. Additionally, with two of the four teachers demonstrating satisfaction with the logistics issues indicated by their low level of Stage 3-Management concerns, it could be evidence of the SBLs doing their best to support the science teachers and to provide them with what they needed to enable the adoption process.

5.4.4. Overall summary for the HPS

The first issue presented regarding the HPS was about the ways through which the SBLs in this case-study school guided science-teachers' implementation of the 2005 Tanzanian ISCS Curriculum. The findings about the participant science teachers' implementation configuration and their SoC were then presented. The final major section presents findings regarding the Stages of Concerns of the participant science teachers in this case-study school. The next section presents the cross case-findings, and explores, compares, and synthesises the main findings.

5.5. The Cross-Case Findings

This study was conducted in three case-study schools: the HPS, MPS, and the LPS. The goal of this cross-case analysis is to explore and identify themes that emerged from each of these case-study schools and then to establish an aggregate of findings. The presentation of the cross-case findings starts by depicting the context of each of the case-study schools, portraying any disparities between them. Then, the section

presents findings that emerged common to all case-study schools in relation to the SBLs' practices of guiding adoption and science teachers' Stages of Concern (SoC), Level of Use, and Configuration of their Implementation (CI) of the 2005 Tanzanian ISCS Curriculum. The cross-case analysis concludes with the issues that appeared to challenge these processes.

5.5.1. School backgrounds and contexts

The three case-study schools were in the same town and at somewhat equal distances from the Regional Education Office. In this regard, all three case-study schools could equally access educational support, regarding this curriculum, from the Regional Education Administration.

Leadership experience of the SBLs in all case-study schools ranged from two to six years. While most of them had the teaching experience ranging between four to 12 years, only the HoD in the MPS had a much greater teaching experience of 23 years. Similarly, while the teaching experience of most participant science teachers ranged from three to 10 years, there was one science teacher in the HPS and one in the MPS with the teaching experience of more than 20 years. These two were the only participant science teachers who had trained to deal with the 2005 Tanzanian Inquiry and Student-Centred Science (ISCS) Curriculum; and hence, they were the potential source of change-adoption support in their departments.

The case-study schools had a similar structure of school leadership, consisting of the School Principal, the General Academic Master/Mistress (GAM), and the Heads of Department (HoD). However, the HPS and MPS each had two GAMs, one for science and another for non-science subjects, while the LPS had only one GAM overseeing implementation of both science and non-science subjects. That is to say, the GAM in the LPS was also managing curriculum implementation covering other subjects which she had no specialist training.

The HPS and MPS had more favourable circumstances for science teachers to adopt the 2005 Tanzanian ISCS Curriculum when compared with the LPS. Classrooms in the HPS and MPS were much less crowded compared with the situation in the LPS.

More importantly, laboratories in the HPS and MPS were well resourced to support instructional processes compared with the LPS. In view of these two contextual factors, one might be able to predict differences in the level of adoption of this curriculum between case-study schools.

5.5.2. Curriculum-adoption leadership strategies

Generally, four cross-case themes concerning the change management practices were found. Three of these were about leadership approaches: administrative practices; participative practices; and, learning community practices. The fourth theme was about factors influencing curriculum adoption and its leadership. The SBLs within each case-study school adopted different practices to implement these practices. It is also important to note that these approaches were not mutually exclusive, but rather, were mixed in varying ways by the SBLs in each case-study school to drive forward the change.

The administrative practices emerged quite repeatedly from the data collected in all case-study schools, suggesting that it was the dominant approach employed by the SBLs to managing the adoption of the 2005 Tanzanian ISCS Curriculum in all of these case-study school. Encouraging a community of practice was employed in all case-study schools but was more strategically employed in the HPS and the MPS. The tendency of involving the science teachers in the processes of making decisions related to the adoption of this curriculum was observed in the HPS and the MPS but not in the LPS. The next subsections detail each of these themes.

5.5.2.1. *Administrative leadership practices*

Drawing on the findings presented previously, it became evident that the SBLs in all of the case-study schools relied heavily on their administrative authority and applied it in monitoring instructional processes in their schools. The SBLs supervised the implementation of the 2005 Tanzanian ISCS Curriculum administratively in three ways. First, they collected teachers' instructional records, particularly Lesson Plans and Schemes of Work, for the inspection and the evaluation of the implementation. Second, the SBLs carried out walkthrough observations, albeit very occasional. They

wandered past and into classrooms to observe the ways teachers proceeded with the implementation of this curriculum. The third method of monitoring implementation involved questioning science teachers in group meetings concerning their classroom practices. Sometimes, the SBLs corroborated science teachers' claims or responses by interviewing students.

There were variations in how the SBLs applied these administrative approaches to monitoring the adoption in the three case-study schools. For example, it was only in the HPS where the SBLs interviewed both the science teachers and students. The SBLs in the LPS did not question the science teachers while those in the MPS did not interview students. Importantly, the SBLs in only the HPS interviewed students about their teachers' instructional practices in more organised ways. The SBLs in this HPS placed opinion boxes for students to provide their views about teaching at their own convenience and anonymously. The SBLs in the LPS interviewed students only, and they did it in public. As each of these questioning approaches tend to influence the quantity and quality of information collected, they may equally have determined differences in the degree of the SBLs' success in guiding the adoption of this change in the three case-study schools.

Notwithstanding these variations, administrative adoption-leadership practices were generally not strategically inclined towards guiding curriculum adoption in all three case-study schools. Findings obtained, mostly through document analysis, revealed that monitoring of the instructional planning processes was not done frequently, and this suggests a lack of sustained information concerning teachers' adoption progress. Moreover, the SBLs in all of the case-study schools provided very limited feedback on instructional planning problems in these documents, which generated difficulty for the science teachers to understand the appraisal, opinions and guidance intended by their SBLs on the implementation. One key reason for this tendency could be the lack of standard rubric that could have guided the SBLs in this activity.

Perhaps more importantly, a large part of administrative efforts was inclined towards ascertaining and encouraging the pace at which the science teachers implemented the 2005 Tanzanian ISCS Curriculum. This emphasis was more apparent in the LPS,

where the SBLs instructed science teachers authoritatively to ensure they cover their subject syllabuses despite complaints regarding unfavourable classroom conditions. Given this situation, one could expect the tendency to revert to a teacher-centred and teacher-designed curriculum by the science teachers, as this was the only method by which they could cover ample content within the limited time available.

5.5.2.2. *Promoting change through empowerment*

Allowing the science teachers to take an active role in conceiving better curriculum adoption methods seemed the SBLs' second most popular collaborative approach to change-leadership. To capture teachers' opinions, the SBLs employed several tactics. One of these involved convening regular staff meetings. Meetings became platforms to discuss both the curriculum adoption progress and the challenges perceived and or encountered by the science teachers in such attempts. Meetings were also important avenues for the SBLs in the HPS and the MPS to negotiate with the science teachers concerning the adoption of this curriculum. The science teachers, particularly in the HPS and MPS, reported satisfaction with this practice. Some of them reported using such meetings to inform their SBLs about the logistical problems they encountered and to make request for material support.

Unlike in the HPS and the MPS, no evidence of department-level meetings was observed in the LPS. All discussions concerning the curriculum adoption in this LPS were conducted in 'general staff meetings', which involved all teachers in the school. Therefore, meetings exclusively for the science teachers to discuss the adoption of this curriculum in the instruction of their specific subjects were, at best, uncommon, if indeed they happened at all. Importantly, there was evidence to suggest that the SBLs in the LPS tended to spend a large part of the meeting sessions for making announcements and reminding teachers of the necessity to cover syllabuses rather than discussing with them about their perceived adoption challenges and generating ways and strategies on how to proceed.

Consultation was another approach to change leadership that was employed by the SBLs to empower their science teachers. The SBLs tended to consult teachers who seemed more experienced in this curriculum and in the teaching profession for both

advice and sharing of experience. The researcher registered the frequent use of this approach in the MPS, somewhat in the HPS, and not at all in the LPS. Specifically, one of the participant science teachers (Amina) in the HPS and one (Bertha) in the MPS were regularly consulted. One possible reason for this observation is that these science teachers in the HPS and MPS had attended intensive training covering the implementation of the 2005 Tanzanian ISCS Curriculum. In contrast, none of the science teachers in the LPS had experienced any in-service training specific for the implementation of this curriculum.

Likely because this leadership practice pleased those who were being consulted, they reported having supported their colleagues in several ways on several occasions. For example, Teacher Amina in the HPS stated that she helped her colleagues to organise and conduct Biology practicals in this school.

5.5.2.3. *Promoting adoption through collegiality*

The SBLs in all three case-study schools attempted to promote adoption of the 2005 Tanzanian ISCS Curriculum by nurturing professional learning communities. All of the SBLs agreed that such practices allowed their teachers to share their challenges and understanding of this curriculum.

The SBLs enhanced collegiality in two main ways: by convening regular academic meetings, and by encouraging networking among teachers. Nevertheless, not all of these methods were employed by the SBLs in each case-study school. Even for those applied in each case-study school, the researcher recorded disparities in their use, suggesting differences among the SBLs' approaches to bringing about collegiality among the science teachers and in influencing the curriculum adoption in the three case-study schools.

Convening staff meetings focusing on academic matters appeared to be the strategy employed most frequently by the SBLs in all three case-study schools to enhance collegiality. The SBLs believed that these were useful avenues for teachers to share their experiences and or to find answers for problems that hindered their curriculum adoption efforts. Nevertheless, the researcher recorded a paucity of meetings at the

departmental level in the LPS, which suggested that science teachers in this school had no separate platform for them to discuss issues specific only to their subject. The SBLs in the HPS and MPS did convene separate departmental and entire staff meetings.

To ensure the presence of an increased level of collegiality, the SBLs in the HPS and the MPS allocated each category of science-subject teachers to one office. That is, all Biology teachers occupied one separate office, Chemistry teachers in their separate office, and the same arrangement applied for Physics and Mathematics teachers. This organisation of teachers not only created physical proximity but was also most likely helpful to promoting peer-to-peer interactions and enhance trust among same-subject teachers, all of which are imperative in dealing with an innovation.

Additionally, The SBLs in the HPS networked their science teachers with colleagues from other developed countries who have applied the inquiry and student-centred instructional methods for a considerable length of time. In this way, science teachers in this HPS had a chance to learn from their more experienced overseas colleagues.

5.5.3. Intervening factors

Findings revealed some factors that influenced the SBLs' approaches to guiding the adoption of the 2005 Tanzanian ISCS Curriculum. These included: their capacities to guide this curriculum; limitations presented by the interaction cultures within each of the case-study schools; and, contextual limitations. Directly or indirectly, these may explain what influenced the SBLs to employ only a few observed change-leadership approaches in their schools, why they implemented these methods in ways described previously, and the challenges they faced in such undertakings.

5.5.3.1. *Curriculum leadership capacity*

The capacities of the SBLs to guide the 2005 Tanzanian ISCS Curriculum adoption process emerged to be one of the major findings. As introduced in the background section, most of the SBLs in all case-study schools lacked practical experiences in both teaching and teacher leadership. While their teaching experience ranged from four to 10 years, their teacher (instructional) leadership experience ranged from only

one to three years. Importantly, many of them were not satisfactorily aware of the 2005 Tanzanian ISCS Curriculum, especially given the fact that they themselves did not participate in bringing it about and lacked rigorous in-service training covering it. Such a picture may suggest that all of the SBLs had insufficient capacities and skills, and they likely lacked adequate levels of self-efficacies to manage and guide the implementation of this curriculum.

5.5.3.2. *Interaction culture*

The nature of interactions among teachers and with their SBLs seemed problematic in all the case schools. Interactions were characterised by norms of privacy, varying degrees of mistrust, and a culture of classroom independence. The SBLs reported several cases of their teachers considering themselves as well-trained professionals and having the same or even higher capacities as all the other colleagues within their schools. The SBLs stated that this perception influenced their teachers to hesitate to disclose their failure to understand this curriculum or even to seek support from their own colleagues to develop the skills they lacked.

Similarly, this interaction climate affected the SBLs' processes they had adopted to manage the uptake of this curriculum in all case-study schools. The SBLs avoided jeopardising their relationship with the science teachers within their schools. Such a climate may suggest that the SBLs were extra careful to keep a boundary between guiding the adoption and interfering with teachers' professional territories. Possibly, this is why the SBLs in all case-study schools avoided providing their teachers with open critiques of their instructions, including how they planned such instructions, or in telling them what they had to do as summarised previously in Section 5.4.2.1.2.

5.5.4. Teachers' level of curriculum adoption

The science teachers' perceptions of the 2005 Tanzanian ISCS Curriculum, Levels of Use, and their Configuration of implementation of this curriculum were examined. The findings indicated the extent to which adoption management helped science teachers in the case-study schools to deal with this curriculum. Presented in the next subsections are the cross-case findings on these issues.

5.5.4.1. *The SoC*

The science teachers in all case-study schools indicated concern about information concerning the 2005 Tanzanian ISCS Curriculum (Stage 1-Information). This appeared the second most intense concern for the science teachers in both the MPS and HPS and the uppermost in the LPS. This suggests that the science teachers in all of the case schools lacked satisfactory information about the philosophy treasured in the 2005 Tanzanian ISCS Curriculum.

Apart from Stage 1-Information concerns, findings suggested more similarities in the Concerns Profiles of the HPS and the MPS. The first similarity emerged at Stage 0-Unconcerned. The majority of science teachers in the LPS were intensely concerned at this Stage while most teachers in the HPS and MPS indicated a much lower level of concern at this stage. This may mean that this curriculum was of high priority and central to the thinking and work of the teachers in the HPS and the MPS compared with those in the LPS.

Another similarity among the science teachers in the HPS and MPS was at Stage 5-Collaboration, and somewhat at Stage 6-Refocusing. At least three of the participant science teachers in each of these two case-study schools expressed intense concerns at these stages. This finding may mean that the majority of science teachers in these two case-study schools desired to collaborate in learning about the key aspects of the 2005 Tanzanian ISCS Curriculum, and that most of them had no plans to implement it differently from the curriculum requirements.

The presence of science teachers who had attended intensive training concerning the implementation of the 2005 Tanzanian ISC Curriculum and the allocation of same-subject teachers to one office in these two case schools, may perhaps be responsible for these findings. As described in Section 5.5.2.3 of this Chapter, these aspects were lacking in the LPS.

The Stage 3-Management concern is worth reporting as ‘an issue’, especially given its powerful influence as blocking factor in the adoption of curriculum. The intensity of Stage 3-Management concerns indicated by the science teachers was much lower

in the HPS and MPS than in the LPS. Importantly, there was very low variation in the intensity of this concern among the science teachers in the LPS compared with their colleagues in the HPS and MPS. That is to say, the Stage 3-Management concerns of the science teachers in the LPS were equally intense. Such a finding may suggest that the science teachers in the LPS perceived more hindrances caused by the resource issues compared with the science teachers in the HPS and MPS.

5.5.4.2. *Configuration of implementation*

Despite considerable variations in the school settings, which often moderates the extent of adoption of educational innovations, the cross-case analysis revealed a high degree of similarity regarding the implementation of the 2005 Tanzanian ISCS Curriculum in the three case-study schools. The following subsections detail these commonalities.

5.5.4.2.1. *Structural components of the implementation*

The structural components refer to the physical aspects of the implementation, and they included locations at which instruction was conducted and the nature of the instructional materials employed. Teaching in the three schools was routinely carried out in classrooms rather than in laboratories. There were few cases, particularly in the HPS, where teaching took place in settings outside classrooms, and laboratory use was generally limited in all case-study schools. Instruction in settings outside the classroom was very uncommon in the LPS, most likely because of the large class sizes (over 70 students) and the extreme lack of resources.

In everyday lesson presentation by the science teachers, the researcher revealed the frequent use of sketches, flip charts, and ready-made resources in supporting their instruction in all case-study schools. That is to say, the science teachers principally relied on physical materials that represented a very small part of the real-world situation.

5.5.4.2.2. *Process component of the implementation*

Given that it is compulsory for all Tanzanian teachers to embrace one framework in organising their lessons, all science teachers in all the case-study schools routinely planned their instruction in the same flow, exhibiting almost the same lesson development process.

Lecturing, questioning, group discussions, and demonstration created what one could describe as the standard teaching landscape in all the case-study schools. The science teachers rarely employed experiential and or hands-on teaching approaches. These instructional approaches, including minor differences in the ways in which they were implemented by the science teachers in the case-study schools, are detailed in the following sections.

5.5.4.2.2.1. Questioning

The participant science teachers in all of the case-study schools applied a questioning strategy regularly and in almost every class session, especially in commencing and concluding their lessons. The researcher observed that questions often invited factual responses rather than higher order thinking or broad discussions. That is to say, the questions were ‘closed’ rather than ‘open’ to promote students’ thinking.

Importantly, the participant science teachers in all of the case-study schools tended to listen only to students who volunteered to respond to questions. Random picking of respondents (i.e., ‘no hands-rule’) was only observed in the MPS and, as reported in section 5.3.3, was exhibited by only one participant science teacher, Bertha.

Another common questioning behaviour exhibited by the science teachers in all of the case-study schools was that of capturing students’ thoughts without allowing subsequent responses to be developed from the half-informed ones. When teachers noted a misconception from even one student, they tended to intervene without checking the thinking of other students. The researcher interpreted this practice of not allowing flipped learning practice to transpire in their classrooms as a signal of lacking student-centred teaching skills.

5.5.4.2.2.2. Discussion

The participant science teachers in all three case-study schools employed either permanent groups of students they had created at the beginning of each academic year (year-long learning teams) or organised small (buzzy) groups during some of the class sessions. Given the difference in the overall science class sizes between these case-study schools, group sizes appeared more suitable for learning in the HPS, less so in the MPS, and were impractical in the LPS where group sizes were reported to be around 15 to 20 students.

Regarding the grouping approach used to foster cooperative learning, the think-pair-share and gallery walk strategies emerged only in the HPS and LPS. Nonetheless, the researcher did not observe the use of more advanced grouping techniques such as 'jigsaw', 'snowball' or 'fishbowls' in any of the case-study schools.

Given these findings, it is apparent that the science teachers in all case-study schools could not guarantee the learning accountability of every student or peer-to-peer learning interdependence in their classrooms. One may, therefore, infer that the student-centeredness generated by cooperative learning approaches could only occur to a very limited extent.

5.5.4.2.2.3. Experiential and hands-on teaching

The participant science teachers attempted to implement the Inquiry and Student-Centred instructional processes through laboratory-based experiments and practicals, as well as through short-lasting classroom activities. Moreover, at least one of the science teachers in each of the case-study schools reported having organised outdoor learning sessions for their students. The researcher's observation, however, recorded the use of outdoor learning sessions from only Amina, one of the Biology teachers in the HPS, and the use of advanced forms of inquiry approaches such as project and problem-based learning or research was neither reported nor observed in any of these case-study school.

The participant science teachers in all of the three case-study schools did organise experiments and practicals. However, the science teachers only implemented those

that were proposed in the syllabus. Most importantly, the findings revealed that the more a practical was from topics frequently examined by the National Examination Council of Tanzania, the higher the attention was paid to it by the science teachers. That is to say, the science teachers' decisions of which of the practical activities they had to arrange for students depended on whether, or not, it was from a repeatedly examined topic. Therefore, hands-on activities not only covered just a few topics, but they were also not frequently set out in a way that students could explore.

More importantly, most practical activities in all case-study schools were explicitly confirmatory, aimed to back-up theoretical claims with evidence, to answers that are already known. Based on their own accounts, it was clear that all of the participant science teachers structured such activities in ways that limited students' opportunities to immerse themselves in open-ended investigation. As such, one may argue that the realisation of the 2005 Tanzanian ISCS Curriculum through this component was also insufficient. The science teachers' use of experiential and hands-on instructional practices revealed during this study may mean that students in all case-study schools were considerably deprived of opportunities to carry out open-ended investigations as required by this curriculum.

5.6. Chapter summary

This Chapter has presented findings concerning the School-Based Leaders' adoption leadership practices, science teachers' level of adoption, and challenges that affected these processes. The implementation of the 2005 Tanzanian ISCS Curriculum shown by the science teachers in the case-study schools varied slightly. Nevertheless, none of them exhibited any advanced forms of inquiry and student-centred configurations of this curriculum. The subsequent chapter discusses these findings in support of the literature reviewed previously.

Chapter Six: Discussion

6.1. Introduction

This Chapter discusses the main findings of the present study concerning approaches employed by the School-Based Leaders (SBLs) to promote the adoption of the 2005 Tanzanian ISCS Curriculum in the case-study schools and their likely influence on the science teachers' implementation of this change. The researcher's interpretations of the findings and the discussion of possible implications are supported with references to the literature. The discussion is divided into three subsections:

- (i). The SBL's strategies of promoting change;
- (ii). The challenges and barriers; and,
- (iii). The science teachers' level of implementation and their main concerns.

6.2. The SBLs' strategies of promoting adoption

The research question addressed in this subsection is: How are the SBLs guiding the Tanzanian lower secondary school science teachers' adoption and implementation of the 2005 Tanzanian ISCS Curriculum?

The findings show that the SBLs in all three case-study schools employed three main strategies in guiding their science teachers' adoption and implementation of the 2005 Tanzanian ISCS Curriculum. These are: managerial (authoritative) change leadership practices; participatory (or empowerment) change leadership approaches; and, by building collegiality (community of shared practice). There were some disparities in the ways in which the SBLs in these case-study schools carried out these leadership approaches. In support of the literature reviewed, the next discussion details these variations.

6.2.1. Managerial leadership practice

This 'bifocal' approach to change leadership is the oldest and most widely employed structure for working directly with teachers (Glickman et al., 2018). Primarily, such

leadership practices aim at controlling instructional practices through administrative (position) powers in schools (Bush & Glover, 2003). In the current study, this was one of the ways through which the SBLs in all case-study schools guided the science teachers' adoption of the 2005 Tanzanian ISCS Curriculum. The data indicated varying degrees of the use of three administrative methods by SBLs in their day-to-day operations, all of which focused on monitoring and 'enforcing' compliance. These were:

- (i). inspections of teachers' delivery records (Lesson Plans and Schemes of Work). Drawing on the findings, Beatrice exemplified this issue when she stated, "*They [SBLs] ask us to collect Lesson Plans and Logbooks on every Friday for inspection*";
- (ii). questioning students and teachers. "*They [SBLs] ask them [students] whether they understand us, or not*", as exemplified by Chaula; and,
- (iii). by walk-through classroom observations. Drawing on the findings, the typical statements showing the use of this practice included that of the GAM in the HPS, "*I sometimes walk around to observe how teachers are faring with their lesson. Through this, I know whether there is a problem or not*".

The inspection of teachers' instructional records was mentioned repeatedly by all of the participants, which suggests that this strategy was most preferred in monitoring the science teachers' implementation of this curriculum in the case-study schools. Findings similar to this were reported previously in the study conducted in Tanzania (Manaseh, 2016) and other countries in Africa (Mngomezulu, 2015; Nzambi, 2012). The inspection of teachers' instruction documents in schools investigated by these researchers was also conducted regularly by school-based leaders to keep track of the teaching and learning activities.

The supervision of teachers' implementation of the innovation is accepted to be one of the best known and widely employed approaches to change leadership practice in schools (Bush & Glover, 2003; Glickman et al., 2018). The classroom supervision allows school leaders as change leaders to reveal and solve systemically any concern

expressed by each of the change users (one by one) in their implementation attempts; and in so doing, it improves the capability of all teachers to deliver their lessons in a systematic manner (Glickman et al., 2018). By using the three mentioned strategies, the SBLs in all of the case-study schools monitored and collected information about the implementation of the 2005 Tanzanian ISCS Curriculum, and attempted to provide feedback, albeit limited, to guide its adoption. Taking these attempts into account, one may interpret that the SBLs in all case-study schools recognised that the supervision of teaching processes is essential for the successful adoption of this curriculum.

Glickman et al. (2018) and the ‘effective school’ research findings (Edmonds, 1979; Weber, 1971) illustrate that the effectiveness of managerial leadership varies from one to another school, and this variation is related to the quality, as well as, range of approaches employed by leaders in monitoring the adoption; how such approaches are undertaken; and, the frequency with which they are carried out. The findings of this study revealed the presence of variations in how the SBLs in the three case-study schools implemented the three change-adoption monitoring strategies they chose.

To evaluate teachers’ classroom effectiveness, questioning of teachers and students occurred only in the HPS. Most importantly, the SBLs in this HPS provided students with highly structured opportunities, including locked opinion boxes, to share their classroom experiences anonymously. In the LPS, questioning of students occurred in public settings where other students could hear. Mtitu (2014) reported the presence of unequal power relations between students and teachers in Tanzanian schools. In view of this, the approach employed by the SBLs in the LPS to questioning students was likely not very conducive to allow students to reveal their inner thoughts. Some students in the LPS were likely not comfortable to provide their reflections regarding their teachers’ instructional practice in the presence of other students. Therefore, it is likely that the SBLs in the HPS were more informed about the curriculum adoption progress compared with those in the other two case-study schools, and the SBLs in the LPS were clearly the least informed.

Notwithstanding such minor variations, evidence indicated that how the SBLs in all of the case-study schools supervised the implementation was not adequate for the professional development of the science teachers. This interpretation is in relation to the limited variety of strategies employed by the SBLs in monitoring adoption of the 2005 Tanzanian ISCS Curriculum. Hall and Hord (2015) encourage change agents to employ a wide range of strategies, including more interactive ones, to collect enough information concerning teachers' progress in adopting change. The SBLs in all case-study schools avoided using approaches that could have necessitated them to interact directly with individual science teachers. All of them, for example, tended to avoid interviewing individual teachers about their implementation. To question and discuss the curriculum adoption with their teachers, the SBLs in all case-study schools opted for staff meetings. Elving (2005) supports the use of meetings in discussing issues related to instruction but cautions that its effectiveness is limited by the mistrusts that limits the interaction of teachers themselves and with their leaders in schools. That is to say, even if meetings were organised frequently, as was revealed to be the practice in the HPS, they were still likely to be less than fruitful in informing the SBLs about adoption progress and concerns, and as such, less effective in influencing the science teachers' adoption of the 2005 Tanzanian ISCS Curriculum.

Moreover, the findings show that the SBLs in all of the case-study schools opted for the walkthrough observation approach alone. All of them did not enter classrooms to observe the ways in which teachers dealt with the 2005 Tanzanian ISCS Curriculum. The walkthrough approach is useful but limits the time required to observe a teacher 'in action' (Fuss, 2018; Kachur et al., 2010). In consideration of this argument, one could interpret that the SBLs in all case-study schools had an incomplete picture of the science teachers' levels of adoption of, and their concerns about, this curriculum.

The interaction between the science teachers and the SBLs in all of the case-study schools could also be examined from the communication perspective. Glickman et al. (2018), Fuss (2018), and Trinter and Carlson-Jaquez (2016) state that the central purpose of supervising instruction is to collect information for both informing and enhancing the growth of teachers' capacities in implementing educational programs. Therefore, the quality of feedback provided to teachers on their instructional practice

is important (Glickman et al. 2018). Drawing on the findings of this study, the SBLs in all of the three case-study schools attempted to provide their science teachers with feedback on their curriculum adoption progress. Appendix 15 illustrates part of this feedback. In this regard, one may conclude that the SBLs recognised the significance of communicating with their teachers, and as such, they attempted to redefine their role to become what Bush and Glover (2013) refer to as ‘strategic’ change leaders rather than as ‘strictly’ managers.

However, the SBLs partly used the information they collected in ‘less’ meaningful ways for the benefit of the science teachers. Glickman et al., 2018 and Trinter and Carlson-Jaquez (2016) recommend not only providing descriptive, reflective, and continuous feedback, but also doing it through both verbal and written approaches. Drawing on the results presented in Chapter 5, the SBLs in all case-study schools observed these requirements to a very limited extent. The science teachers in all of the case-study schools received less frequent feedback, and this happened through low-quality written comments provided in their inspected Lesson Plans and Schemes of Work alone. As shown by Appendix 15, such feedback was not detailed and was largely unclear. In view of Trinter and Carlson-Jaquez’s (2016) opinion, it could be interpreted that the science teachers in all case-study schools failed to understand criticisms, directives, and the guidance intended by their SBLs. That is to say, the feedback provided by all of the SBLs in all of the case-study schools was not a useful source of information for the science teachers’ reference and reflection as they continued attempting to deal with this 2005 Tanzanian ISCS Curriculum.

The paucity of feedback provided by the SBLs might be related to their lack of confidence in their own pedagogical competence. The SBLs avoided bringing their opinions concerning the level of curriculum implementation to the table for joint discussions most likely because they feared being challenged by the science teachers. These assumptions are likely to be relevant given that most of the SBLs in all of the case-study schools had attended very little professional training covering this curriculum as summarised in Section 5.5.3.1. The influence of competence beliefs of change-adoption leaders on their curriculum supervision practices is also reported in the studies conducted by Lochmiller (2016) and Mngomezulu (2015).

Drawing further on the findings, statements such as, “*When I inspect them [Lesson Plans and Schemes of work], I can find teachers who are lazy [who may not finish their syllabus on time]*” (the HoD in the LPS), signalled the SBLs’ tendencies of paying more attention to the pace of the ‘syllabus’ coverage than on quality adoption of the curriculum. This tendency was higher in the LPS compared with the other two case-study schools. The impact of this tendency is resulting in what Fullan (2014) calls “cat-and-mouse game” (p. 29) between leaders and teachers. That is, teachers (mouse) may prepare instructional documents only to run away from leaders’ (cat’s) traps.

This tendency was likely because of the accountability pressure influenced by the position of the SBLs within the broader landscape of the Tanzanian educational management system. According to Fullan (2014) and Earley and Weindling (2004), when the structure of the educational management allocates the significant level of mandate to school leaders to guarantee the implementation of educational programs but less to its conception, then that system compels school leaders to pay more attention to the program coverage than to its quality enactment. The contribution of the SBLs to the conception of the 2005 Tanzanian ISCS curriculum was limited (Mtitu, 2014) but the Tanzanian Ministry of Education requires them to monitor its implementation in schools (MoEVT, 2011). Given this context, one may conclude that it is not surprising that the SBLs’ focused more on the pace and not on the quality implementation.

6.2.1.1. Summary

The use of administrative controls constituted the first strategy by which the SBLs managed the science teachers’ adoption of the 2005 Tanzanian ISCS Curriculum in all case-study schools. Importantly, their instructional supervision had less focus on guiding the science teachers on how to adopt this curriculum. Rather, they inclined their efforts towards curriculum coverage. Administrative approaches to guiding the adoption is also acceptable (Glickman et al. 2018; Fullan, 2014), and the use of this approach is reported in other studies conducted in Tanzania (Manaseh, 2016) and outside Tanzania (Nzambi, 2012; Mngomezulu, 2016). Poor knowledge of this

curriculum coupled with accountability pressure are most likely what compelled the SBLs in the case-study schools to confine their leadership efforts to fostering pace rather than on the quality implementation of this curriculum.

6.2.2. Empowering by involvement

Theorists and researchers (e.g., Hall & Hord, 2015; Harris & Muijs, 2007; Johnson et al., 2014; Lynch, 2012) agree that the transition from control to collaborative leadership practices is essential for influencing staff to adopt an educational change. Ho (2010) argues that teachers' desire to participate in decision making processes is higher for matters of curriculum and pedagogy compared with other issues within a school. Participative leaders enable faculty members to experience a possession of an equal voice and opportunities to engage in collective professional dialogue (Johnson et al., 2014), and this requires the use of sophisticated strategies (Hall & Hord, 2015; Tam, 2010).

This study revealed what could be interpreted as a collaborative approach to change leadership in the HPS and MPS. In their attempts to influence the adoption of this 2005 Tanzanian ISCS Curriculum, the SBLs in the HPS and MPS involved science teachers in making key adoption decisions in various ways. One of these ways was indicated by statements such as, *“At the beginning and end of each term, we have academic meetings that brings all of us together to discuss our progress and share experiences”* (the GAM in the MPS). The SBLs, by involving their teachers, created useful opportunities for the entire faculty to think, grasp, and communicate the vision of this curriculum; to share expertise and experiences; and, to make collective agreements about the possible ways to adopt pedagogies recommended by the 2005 Tanzanian ISCS Curriculum. Lummis et al. (2016) reported that sharing the vision of change through stories about teaching or by collaborative teaching contributes to the professional growth of the staff. That is to say, by organising academic meetings, the SBLs in the HPS and MPS had likely promoted the growth of professional capacities of their science teachers to deal with the 2005 Tanzanian ISCS Curriculum.

In contrast, although the SBLs in the LPS convened academic staff-meetings, they never sought their teachers' views about possible ways to deal with the challenges

they encountered in dealing with the 2005 Tanzanian ISCS Curriculum. The science teachers in this LPS complained that, rather than being allowed to share and discuss their adoption-related concerns, the SBLs used meetings to emphasise the need to comply with their directives and their main emphasis was on covering the syllabus. Chapter 5 presented statements that demonstrate this practice, including one from Chaula who stated, “*They [the SBLs] often dominate discussions. Meetings are full of announcements. They [the SBLs] always tell us ‘This is what you should do’*” In view of this finding, one could interpret that the SBLs in this case-study school did not expect their colleagues to debate anything about the implementation, which echoes views and practices of leaders in some of the schools investigated by Stosich (2017). By failing to listen to the professional thoughts of the science teachers they supervised, the SBLs in this case-study school perhaps opted to rely on the use of change-adoption leadership approach that, according to Glickman et al. (2018) was rigid, directive, and task restrictive.

6.2.2.1. Involvement approaches

Although the involvement of teachers in the process of making adoption-related decisions is essential for promoting teachers’ implementation of change (Hall & Hord, 2015), it is agreed that its effectiveness depends on the extent of the actual involvement and the ways in which teachers are actually involved (Fullan, 2014; Heck & Hallinger, 2010). This understanding is important particularly considering that the involvement of colleagues in the leadership of adoption of change can be done in different ways (Glickman et al., 2018; Ho, 2010; Lynch, 2012), all of which determine what other teachers contribute to, and for, the effectiveness of the change adoption process.

Drawing on the findings, the SBLs in the HPS and MPS involved their colleagues in the process of considering ways of adopting the 2005 Tanzanian ISCS Curriculum using two approaches. First, it was through consensus-based faculty meetings and, second, through the consultation of ‘specific’ teachers. Chapter 5 presented examples of statements that illustrate the first approach, including one from Bernard, the HoD in the MPS, who stated, “*In a meeting, we collect opinion until we reach a consensus*

about how teaching should be done". The SBLs in the HPS and MPS demonstrated being open to teachers. Their adoption leadership involved listening to teachers and giving them freedom to share their professional experience and thoughts. Meetings for the SBLs in the HPS and MPS were useful avenues to collect opinions of their science teachers concerning the 2005 Tanzanian ISCS Curriculum and the ways in which they thought this curriculum could be adapted.

The use of negotiations to ensure the presence of collective agreement in academic discussions, particularly concerning adoption of pedagogies, is highly recommended as this, according to Glickman et al. (2018), increases the likelihood of influencing colleagues to engage in the program enactment. The significant feature of academic meetings in the HPS and MPS was the presence of consensus. There was a limited level of restriction of opinions regarding how to deal with the 2005 Tanzanian ISCS Curriculum during their staff academic meetings. Batuli, as presented in Chapter 5, exemplified this argument by stating that "*Anything we decide in the [staff academic] meeting is based on consensus*". Therefore, one may hypothesise that the SBLs in the HPS and MPS were aware of implications of shared agreements in influencing teachers to adopt new curriculum. This finding echoes those reported by Johnson et al. (2014), Stosich (2017) and Tam (2010). Similarly, these researchers revealed the leaders' understanding of the role played by the collective decisions and agreements in influencing teachers' adoption of educational innovations. By letting the science teachers participate in the discussion, and by seeking their opinions concerning the way to adopt the 2005 Tanzanian ISCS Curriculum, the SBLs in the HPS and MPS valued the science teachers' experience and professional stance, and this, according to Fullan (2014), was useful to promote system-wide growth.

The second approach was through the consultation of 'specific' teachers, and this was primarily a selective involvement of colleagues. The SBLs in the HPS and MPS invited specific teachers to share their practical expertise and experience in relation to this 2005 Tanzanian ISCS Curriculum. As illustrated in Chapter 5, Bakari (the GAM in the MPS), for example, stated, "*Whenever a debate concerning issues of this curriculum emerges, we invite them [the more experienced teachers, particularly those trained specifically to deal with this curriculum] to guide us through. And to be*

honest, they are a good help”. Consulting specific staff members inspires informal teacher-leaders in schools (Harris & Muijs, 2007).

When confronted with a the change, deciding which of the teachers to involve in the leadership of adoption or to consult for advice regarding the guidance of adoption is informed by the change leader’s awareness of the experiences and expertise of all the teachers available within a school (MacBeath, 2005). To be involved in the change leadership, teachers are required to have a satisfactory level of experience with the change (Hall & Hord, 2015; Harris & Muijs, 2007). The SBLs in the HPS and MPS were most likely being driven by this understanding. The science teachers that the SBLs consulted in these two case-study schools were only those who were trained by the Tanzanian Ministry of Education to deal with this 2005 Tanzanian 2005 ISCS Curriculum after it was released.

Distributing the adoption-leadership responsibility to the trained science teachers or eliciting the opinions of these few individuals was perhaps the most useful decision in the context of leading this curriculum. Assigning professional development task to individuals having adequate experience in the innovation stops delaying the adoption (Hall & Hord, 2015). By avoiding assigning the change-leadership responsibility to teachers that they did not trust, the SBL in the HPS and MPS attempted to play safe, and this most likely avoided delaying the adoption. MacBeath (2005) describes this strategy as “pragmatic” (p. 358), and it is also referred to as “internationality” by (Lynch, 2012, p. 150). The SBLs in the MPS and HPS stated that they consulted the few teachers who had attended intensive training covering this curriculum because they believed that these could influence their peers to adopt this change. Trusting and involving a few ‘significant’ others in pedagogical leadership is also reported in the studies conducted by MacBeath (2005) and Tam (2010). The HoDs in the research carried out by Tam (2010), for example, invited experienced colleagues from within their schools to join the decision-making group, and as such, these HoDs used their colleagues to influence others to adopt the educational program.

The researcher is of the view that one of the possible reasons that impeded the SBLs in the LPS from opting this strategy of consulting and engaging some teachers in the

curriculum adoption-leadership was the fact that none of the science-teachers in this case-study school had attended in-service training focusing on the implementation of this 2005 Tanzanian ISCS Curriculum. This interpretation is supported by academics such as MacBeath (2005) and Sagnak (2016), who suggest that school-based leaders in such a situation are more likely to perceive their colleagues as less suitable for the teacher-leadership of change adoption, and therefore, cannot be consulted.

6.2.2.2. *Perceived advantages*

When SBLs guarantee the involvement of staff in the pedagogical decision-making process related to adoption of change, research reveals an increase in the intrinsic motivation of the staff (Lummis et al., 2016), and this is positively related to the commitment of the school to the change (Sagnak, 2016). The participation of staff members in the decision-making process is furthermore related to an increase in the teachers' willingness to engage in undertaking teacher leadership (Johnson et al., 2014). In the HPS and MPS, those who were referred to as the 'expert' teachers appeared willing to carry out teacher-leadership responsibilities. Amina, one of these expert science teachers in the HPS, for example, recalled having started guiding her colleagues to review some of the experiments recommended in the Biology Syllabus and consider how each of them could be implemented in their laboratories. Similarly, Bertha in the MPS recalled having agreed to help colleagues to plan science lessons. Accepting to undertake these responsibilities was possibly the outcome of feeling valued by the SBLs as observed by Lummis et al., (2006).

Schools undertaking innovations have been more dependent on the willingness of the 'informal' leaders to perform beyond their formally prescribed job descriptions (Harris & Muijs, 2007; Lynch, 2012). Participation in the decision-making process, particularly concerning the use of pedagogy, enhances the motivation and willingness of the faculty to assume the adoption-leadership tasks (Johnson et al., 2014; Sagnak, 2016). Arguments and reports provided by these academics appear to tally with the findings of this research. It is most likely that change-related consultation arranged by the SBLs in the HPS and MPS sent an inspiring message to the most experienced science teachers, making them feel worthwhile in leading the

2005 Tanzanian ISCS Curriculum adoption. By consulting opinions of the science teachers regarding this curriculum, it is likely that the SBLs in the HPS and MPS enhanced the self-efficacy levels of the consulted teachers, and this encouraged them to remain engaged in the process influencing and mobilising others to engage in the adoption.

The involvement of curriculum users in the discussions focusing on the pedagogical issues is also believed to help to shift the perceptions of curriculum users regarding the person controlling their change-adoption (Fullan, 2001). When the implementers believe that their opinions about the adoption process are valued, previous research (e.g., Johnson et al., 2014; Somech, 2010) revealed that they manifest an increased ambition to participate in further change-related discussions. The present study noted similar tendencies among the science teachers in the HPS and MPS. Some of the participant science teachers in these two case-study schools recalled having voiced their opinions and concerns openly and regularly about the adoption of the 2005 Tanzanian ISCS Curriculum during their academic meetings. The GAM in the MPS, as illustrated previously in Chapter 5, informed, *“Even those who tended to feel shy [to express their problems] or those who decided to stay silent in our meetings are now talking in the meetings. Such attitude [feeling shy or being silent] has started to disappear”*. In their study, Johnson et al., (2014) observed that it is the perception of ‘trust’ that activates teachers’ engagement in pedagogical discussions within schools. On these grounds, we may infer that the active participation revealed by some of the participant science teachers in the adoption decision-making processes in the HPS and MPS was because they felt being valued by their SBLs, and they also perceived the presence of positive relationships and trust within these schools.

Literature indicates that discussing and agreeing with the staff about various aspects of innovation increases both their loyalty to pedagogical-adoption decisions and their willingness to apply them in their classrooms (Sagnak, 2016; Somech, 2010; Tam, 2010). By considering this literature, one could infer that the attempts of the SBLs in the HPS and MPS to exhibit trust and optimism in colleagues energised their staff to attempt to adopt the 2005 Tanzanian ISCS Curriculum. That is to say, the science teachers' perceptions of positive self-efficacy and attitudes triggered by their SBLs in

these two case-study schools likely helped them to utilise their little abilities to deal with this curriculum.

Further understanding of the impact of involving colleagues in the change leadership is emphasised when examining the situation in the LPS. Fullan (2014) and Glickman et al. (2018) are of the view that when leaders in schools retain the decision-making power over curriculum-adoption matters to themselves or when they largely rely on fostering compliance, the perception of their teachers about their capabilities to solve their program-adoption concerns is negatively affected. Drawing on the findings presented in Chapter 5, all of the participant science teachers in this LPS described their working environment in much more negative terms, signalling low morale. In their interview statements and in the SoCQ, the science teachers in the LPS indicated that they had doubts about whether, or not, they could successfully deal with the adoption of the 2005 Tanzanian ISCS Curriculum. Complying with the inquiry and student-centred instructional approaches recommended by this curriculum, according to them, was ‘hard’ and time-consuming. “*I have tried several times [to use inquiry and student-centred instructional practices],”* Chaula stated during the interview, “*but I can tell you that this [the enactment of] curriculum is almost impossible in our context*”. The SBLs’ tendency of promoting the pace of implementation is most likely one barrier that limited their science teachers from developing a positive self-efficacy regarding their capacity to succeed in the adoption of this curriculum in teaching their subjects. Similar findings are reported from lower performing schools in researches conducted by Johnson et al., (2014), Tam (2010), and Stosich (2017).

6.2.2.3. Summary

Participative leadership (staff-wide consensus-based discussions and consultation of few experienced ones), appeared to be the second strategy employed by the SBLs in influencing teachers to adopt the 2005 Tanzanian ISCS Curriculum. The SBLs in the HPS and MPS attempted to establish a ‘problem-solving collegial climate’ by drawing on the expertise of their colleagues, and this occurred by: (i) convening meetings and (ii) consulting the experienced science teachers to guide others to deal with the 2005 Tanzanian ISCS Curriculum. This change-leadership approach held

many advantages for the SBLs in the HPS and MPS. First, it freed them from carrying out the leadership of change by themselves (Tam, 2010). This appeared to be the most useful advantage given that most of the SBLs were not very conversant with this curriculum. Second, permitting collegiate pedagogical decision-making processes in the HPS and MPS motivated the science teachers to engage in the ongoing school-based professional learning related to this change.

These findings extend the literature on the participative leadership of instruction and, in particular, when attempting to adopt new pedagogies. Hallinger (2011) and Fullan (2001) are of the view that change users like to visualise themselves in the equation of change and realise that the change is largely a joint process between themselves, the change designers, and the change adoption-leaders. Involving colleagues in the leadership of change, according to (Hall & Hord, 2015), increases the likelihood that the ‘stragglers’ will adopt the change in schools. Participation makes users of change feel in ownership of the change rather than perceiving it as something imposed on them (Hallinger, 2011). The collaborative leadership practice in the HPS and MPS inspired the science teachers to share their experiences regarding the implementation of the 2005 Tanzanian ISCS Curriculum. Given that this leadership practice tends to enhance teachers’ beliefs of their capacity to deal with a change (Harris & Muijs, 2007; Lynch, 2012), it is likely that it influenced an increase in the adoption of the 2005 Tanzanian ISCS Curriculum in these two case-study schools. This supposition is backed up by the research findings reported by Johnson et al. (2014), Tam, (2010), Stosich (2017), and Somech (2010).

Involving teachers in the pedagogical decision-making process is a worthy pursuit as it increases the possibility of influencing stragglers to adopt the innovation (Harris & Muijs, 2007). Given that the SBLs in the HPS and MPS involved the staff members in familiarising with the 2005 Tanzanian ISCS Curriculum, there was most likely an increase in their science teachers’ attempts to adopt the recommended pedagogy in their classrooms.

6.2.3. Collegiality as a change-adoption fostering strategy

Collegiality appeared to be the technique to empower the science teachers to support one another, particularly in the HPS and MPS. The SBLs in these case study schools fostered collegiality to promote the science teachers' adoption of the 2005 Tanzanian ISCS Curriculum. Drawing on Chapter 5, the HoD in the HPS emphasised, "*We are teamed up and this practice is one of the issues we remind our teachers*" (Anna). As seen in the reviewed literature, theorists (e.g., Leithwood & Jantzi, 2006; Hargreaves & Fullan, 2014) encourage school leaders to cultivate interconnectedness focusing on the teaching work among teachers. This collegiality allows the teachers to discuss what they do for students and whether, or not, their instructional practices result in any desired effects (Hall & Hord, 2015).

The SBLs in these two case-study schools indicated that they encouraged reflective discussions because this practice allowed the science teachers to exchange their understanding of, and the capacities for dealing with, the 2005 Tanzanian ISCS Curriculum. As illustrated in the findings presented in Chapter 5, Bernard, the HoD in the MPS, claimed that "*I do not just tell them like 'do this way'. No. I create an environment in which we can collaboratively solve challenges and create uniformity. I believe that some of us know better*". The SBLs in the HPS and MPS believed that the teachers, following their connectedness, were able to relive, reflect, and to share what the GAM in the MPS referred to as to as "*practices and success stories*". The use of this approach to managing adoption of educational programs in the successful schools is also reported in other research (Ford & Youngs, 2018; Rogers, 2014; Stoll et al., 2006). In their research, for example, Stoll et al. (2016) found that the ongoing collegial learning practices or opportunities within schools permitted teachers to own the responsibility for developing their pedagogical capacities, and this improved the enactment of the curriculum.

Possibly because of these interactions, the participant science teachers, particularly in the MPS and HPS, revealed some interests in this new curriculum. As detailed in Chapter 5, the findings suggested some improvements in the enactment of this 2005 Tanzanian ISCS Curriculum in the HPS and MPS notwithstanding that some science

teachers in these case-study schools still demonstrated a lack of confidence and skills to use inquiry instructional approaches. These findings are consistent with Hall and Hord (2015) who argue that interactions enable the networking of different teachers' experiences, and this allows users to develop a positive sense of change. Based on these, one may interpret that the SBLs' understanding of their positions as change-leaders and their attempts to nurture learning communities and connectedness of the science teachers were useful in influencing the adoption of the 2005 Tanzanian ISCS Curriculum.

6.2.3.1. *Tactics used to build collegiality within schools*

Although collegial interaction is a fundamental component of the onsite and ongoing professional developments of teachers, this study agrees with the previous research (e.g., Awbery, 2014; Fallon & Barnett, 2009; Fitzgerald et al., 2017; Harris & Muijs, 2007; Rogers, 2014) on the fact that valuable interactions within a school oftentimes emerge after the leaders have nursed them. The need for the leadership to nurse such collegiality appears to be particularly important not only because the occurrence of staff relationships requires time and opportunities to interact (Awbery, 2014; Stoll et al., 2006), but also due to the fact that engagement in collaborative learning is (i) a voluntary process, and (ii) open to a range of individual teacher's needs and interests (Ford & Youngs, 2018; Hall & Hord, 2015; Rogers, 2014; Stoll et al., 2006). Based on these two influences, the level of collegiality oftentimes covary with the nature of change-leadership in schools (Hall & Hord, 2015; Hargreaves & Fullan, 2012).

As detailed in Chapter 5, there were differences in the level of interactions amongst the science teachers and with their SBLs in the case-study schools. Importantly, such differences appeared to covary with the ways in which opportunities for collegiality were strategically influenced by the SBLs in the three case-study schools. The SBLs in the MPS and HPS, as discussed below, employed somewhat similar approaches, which suggests more similarities between these two schools on this aspect.

In the HPS and MPS, the collegiality was enhanced further by allocating the same-subject teachers to one office. Therefore, the opportunities for the science teachers to share professional experience was enabled by the physical proximity, the space, and

time, reflecting the observation of Stoll et al. (2006). “*When we are organising our staff*”, the GAM in the MPS stated, “*we allocate same-subject teachers in one office with their HoD*”. The SBLs in these two case-study schools maintained that they employed this strategy to inspire their science teachers to share and augment their understanding of the 2005 Tanzanian ISCS Curriculum. “*We want them to access convenient support from those experienced in their [own teaching] subjects*” was Bakari’s explanations of why they opted to organise their staff in this way. Findings such as these are also reported in the studies of Stoll et al. (2006) and Ford and Young (2018). In these studies, school leaders provided their teacher colleagues with regular meeting times, and this allowed such schools to operate as communities of shared practices. The decision to arrange staff members in this way is recommended for the development of both serendipitous and formal interactions amongst teachers and with school leaders, especially because such an arrangement gradually develops the relational trust among the staff within schools (Stoll et al., 2006). More generally and as discussed previously in this chapter, school-wide and departmental meetings was the primary means through which collegiality was championed in all case-study schools. To some extent, such arrangements brought the science teachers in the case study schools together to generate answers for the problems they faced and concerns they perceived in dealing with this curriculum.

The staff organisation was slightly improved in the MPS, where both same subject teachers and their HoDs were allocated to the same office. This inclusive allocation likely prevented power-relationships from blocking communication and augmented the growth of trust among science teachers and with the HoDs. This interpretation is based on Harris and Muijs (2007) and Fullan (2014), who are of the view that when teachers and their leaders establish closer physical proximity on a daily basis, they are likely to feel related to each other, and this increases the chance for them to work as colleagues (Harris & Muijs, 2007). Comments such as “*It is like we are colleagues*” (Beatrice) and “*There is no barrier in sharing and supporting each other*” (Bernard) illustrated a sense of camaraderie and ‘connectedness’ amongst the science teachers in the MPS and HPS. Importantly, organising the staff in this way, as illustrated by the evidence presented in Chapter 5, permitted the HoD in the MPS

to initiate debriefings in the staffroom on matters pertaining to the 2005 Tanzanian ISCS Curriculum with minimal hesitation as he believed that this arrangement nurtured trust with the teachers in the science department.

Based on these findings, it could be interpreted that the SBLs in the MPS and HPS considered the fact that managing the structural resources of ‘time’ and ‘space’ are critical factors for teachers to engage in collegial professional development. These findings complement the argument of Stoll et al. (2006) and the study findings of Fallon and Barnett (2009) and Awbery (2014), all of which demonstrate that the strategic management of structural resources is a powerful way of nurturing strong professional interactions for improving the teachers’ mastery of the implementation of new teaching methods.

Conclusions regarding the utility of collegiality in boosting the teachers’ adoption of changes (Fitzgerald et al., 2017; Hall & Hord, 2015), and the importance of SBLs’ position in promoting its occurrence (Awbery, 2014; Ford & Youngs, 2018; Rogers, 2014) could further be complemented by contrasting the situation in the LPS where the current study revealed a much lower level of collegiality. Although the SBLs in this LPS described collegial interactions as a central aspect of their ways of meeting the expectations of this curriculum, there was enough evidence to suggest that they were themselves not much committed to institutionalise this culture. First, the SBLs in this case-study school allocated the experienced teachers to a separate office from the inexperienced ones, and for them it did not matter whether, or not, science and non-science teachers were allocated to the same office. As discussed before, Stoll et al. (2006) and Ford and Youngs (2018) inform us that teachers are not likely to engage in ‘sensitive’ discussions concerning their pedagogical issues unless they feel they are related. That is to say, although the SBLs in this case-study claimed having reminded their teachers to work together on matters pertaining to this curriculum, it is likely that the science teachers’ perceptions of their ‘relational trust’ decreased their levels of interactions. It is, therefore, possible that this non-strategic allocation of science teachers in the LPS limited the occurrence of serendipitous conversations, which could have played a big role in increasing the adoption of the 2005 Tanzanian ISCS Curriculum.

The second indication of ineffective ways of fostering collegiality in the LPS was based on the climate of academic meetings. Discussions concerning this curriculum in this case-study school occurred mainly through meetings involving all members of staff. While such academic meetings can present a convenient platform for teachers within a school to advance their teaching capacities, Stoll et al. (2006) cautions that meetings that involve the entire staff within a school tend to discuss issues in general ways rather than dealing with the subject or discipline-specific issues. That is to say, the use of such meeting structures alone in this case school presented narrow chances for science teachers to discuss how to resolve issues that were specific to themselves concerning the implementation of their subjects.

In this LPS, none of the science teachers was trained to deal with the 2005 Tanzanian ISCS Curriculum. Having colleagues who are somehow experienced in innovation at the same school, according to Fitzgerald et al. (2017), is essential for the adoption of an innovation. Teachers experienced in this 2005 Tanzanian ISCS Curriculum could have trained colleagues on the best ways to deal with it. The presence of colleagues could have increased the diffusion of this curriculum in this LPS because, according to (Fitzgerald et al., 2017), it is more likely for a teacher to engage in the adoption through peer-to-peer influence.

The researcher acknowledges that the ‘unfavourable context’ in the LPS limited the SBLs from developing a climate that could foster science teachers’ learning of 2005 Tanzanian ISCS Curriculum through professional interactions. Unlike in the MPS and HPS, this case-study school had (i) very few buildings, and (ii) a large student-to-teacher ratio. Likely, such circumstances not only challenged the SBLs regarding the way to organise opportunities for ongoing collegial interactions in this school but were also too complicated for the science teachers to meet as they themselves had ‘tight’ teaching schedules.

6.2.3.2. *The overall nature of collegiality in case-study schools*

Notwithstanding the variations in the ways in which the SBLs fostered communities of practices in the case-study schools to promote the adoption of the 2005 Tanzanian ISCS Curriculum, the collegial interactions in all case-study schools can generally be

considered as less advanced by the criteria described by Fallon and Barnett (2009). Even in the MPS and HPS, discussions about the adoption of this curriculum were ‘opportunistic’ as the sharing of experience occurred only when a particular teacher had asked. Fallon and Barnett (2009) categorised such practices as “weak forms of collegiality” because they encourage the faculty members to preserve the “boundary between offering support and interfering in unwarranted ways in another teachers’ work” (p. 5). Strong collegiality is demonstrated when one feels very free to support others without limitations.

Additionally, the nature of professional interactions in the case-study schools could be interpreted as simply ‘comfortable’ as the teacher-interactions seldom extended to classroom settings where team-teaching and the observation of each other’s teaching could occur (Hargreaves & Fullan, 2012). This interpretation was exemplified by the HoD in the MPS who was of the opinion that “*Sharing an office with my colleagues is a golden opportunity. Because we use the same office, I have chances to hear their [teachers’] classroom stories and sometimes engage in debriefing their instructional practices*”.

Powerful professional discussions, according to Glickman et al., (2018) and Rogers (2014), emerges gradually and continues to advance and strengthen as each teacher acts and reacts to the actions of others. Over time, a more enhanced readiness to take part in reflective inquiry occurs, the stage at which teachers start to examine their shared practice critically and freely (Rogers, 2014). Given this knowledge, one could conclude that the low level of collegiality identified in all three case-study schools is not surprising. The relatively low interaction levels revealed in these schools could be an outcome of these professional interactions and cultural reference being in the early stages of development. Their interactions may advance over time.

6.2.3.3. Summary

Fostering collegiality in schools appeared to be the second strategy through which the SBLs attempted to maximise the adoption and mastery of the 2005 Tanzanian ISCS Curriculum among the science teachers. The SBLs attempted to engage science teachers in professional collegiality. They discussed and shared their challenges and

experiences regarding the implementation of this curriculum. However, there were disparities between the case-study schools in this aspect. The MPS was a little more effective in the use of this approach than the other two case-study schools, and the LPS was the least effective in its use.

These findings reinforce a long-established research finding in that a teacher can hardly, if ever, independently advance her/his instruction capability (Awbery, 2014; Rogers, 2014), especially when one is attempting to adopt a new innovation (Hall & Hord, 2015). By showing the advantages of professional interactions within a school adopting the change, these findings complement the advocates of collegiality (e.g., Awbery, 2014; Rogers, 2014; Stoll et al., 2006). Furthermore, these findings extend the discussions concerning the powerful position of school-based leaders in creating the circumstances that could influence teachers' adoption of change. The current study findings and previous research (Fallon & Barnett, 2009; Ford & Youngs, 2018; Stoll et al., 2006) inform us that the interconnectedness of teachers hardly transpires in schools unless school leaders nurture it strategically. And in view of this, the level of collegiality often covary with the leadership practice within school (Hall & Hord, 2015).

6.3. Challenges and barriers

The current study has revealed contextual limitations to both change leadership and adoption of the 2005 Tanzanian ISCS Curriculum in Tanzanian secondary schools, some of which were not raised by previous studies conducted in Tanzania. The findings indicate that the methods employed by the SBLs in all case-study schools to lead the implementation of this curriculum and how they carried out this change leadership tasks were limited by their leadership capacities and the norms of independent teaching. Moreover, the effectiveness of change leadership in championing the science teachers' adoption of this curriculum was influenced by the instructional environment. These frame factors operated in interaction with each other, but they are discussed separately in the next subsections to address each of them in greater detail.

6.3.1. SBLs' capacity to lead the curriculum-adoption

The SBLs are responsible for improving the implementation of change within their schools. Therefore, it is essential that they are well experienced in the change and in their teacher-leadership responsibilities (Hall & Hord, 2015). The present study revealed that the SBLs in all case-study schools lacked experience in instructional leadership as well as in the leadership of adoption of the new curriculum. As presented in Section 5.5.3.1, the SBLs' experience in the teaching profession was between four and ten years and their instructional leadership experience was between one and three years. Moreover, most of them were not particularly aware of the 2005 Tanzanian ISCS Curriculum, as they had not been trained to deal with this change.

The paucity of SBLs' experience is worrying. Fuss (2018) and Gilley et al. (2008) revealed that long-term leaders exhibit greater success in guiding implementation of new educational programs because of the experiences they have acquired in leading instruction. Taking this literature into account, one may conclude that all of the SBLs in all of the three case-study schools had limited capacities to be able to guide the adoption of the 2005 Tanzanian ISCS Curriculum properly.

Gilley (2008) reports that when the leaders lack pedagogical leadership experiences, they are not likely to be able to select and use powerful leadership strategies or to communicate effectively with their teachers concerning change implementation. In what could be interpreted as a reflection of this literature, the SBLs in all of the three case-study schools failed to choose and utilise more advanced adoption-monitoring tactics. As discussed previously in Section 6.2.1, all SBLs, for example, gauged the progress of their science teachers' adoption of the 2005 Tanzanian ISCS Curriculum by using less-interactive approaches.

The effect of having insufficient knowledge of the 2005 Tanzanian ISCS Curriculum was in part revealed in the superficiality of change-guidance they did provide. Likely because of having low pedagogical self-efficacy, all of the SBLs seldom provided overt feedback to the science teachers concerning their curriculum implementation, and when they attempted to do so, it was not detailed enough to provide any useful unambiguous information that would be of use to the science teachers. Rather, when

they provided, it left the science teachers somewhat confused and uncertain about how to address the situation. Perhaps more importantly, while leaders of instruction and change are required to address the teachers' questions and issues, the SBLs in all of the case-study schools, as indicated previously in Chapter 5, had limited expertise to resolve the science teachers' concerns, including the challenge of planning lessons in ways that could enhance the use of the new pedagogy.

The study conducted by Fuss (2018) reports that experienced school-principals had higher competence-beliefs in improving instruction compared with less-experienced ones. Mngomezulu (2015) revealed that although direct involvement of SBLs in the classroom activities was backed by the National Protocol for Assessment in South Africa, the participants in the investigated schools rarely supervised any teaching due to their weak pedagogical competence in subject domains that were outside of their own. If we take this literature into account, we may hypothesise that had the SBLs in the case-study schools adequately experienced in the 2005 Tanzanian Curriculum, they could have made a considerable difference in their curriculum monitoring and guidance practice. Therefore, these findings extend the literature pointing to the consequence of lacking experience in both leadership and change and the consequent impact of this lack on the capacity of SBLs to lead adoption.

6.3.2. Teachers' norms of privacy

As discussed before in Chapter 5, the SBLs in both the HPS and the MPS attempted to frame challenges presented by the 2005 Tanzanian ISCS Curriculum as something that necessitated professional learning through the development of communities of shared practice. The reviewed literature (Elving, 2005; Hallam et al., 2015; Little, 1982; Stoll et al., 2006), informs that exchange of knowledge about, and experience in, change transpires in the circumstance where trust prevails, as every member is required to take reasonable risks to disclose her/his individual teaching qualities. That is to say, openness to one-another was necessary in all of the three case-study schools. The SBLs' success in communicating the philosophy of the 2005 Tanzanian ISCS Curriculum to the science teachers and in influencing them to adopt it in their

classrooms was contingent on the science teachers' willingness to engage in the boundary-free knowledge-sharing processes.

Contrary to the practices in professional communities, where every teacher is free to observe the implementation conducted by their colleagues (Rogers, 2014; Stosich, 2017), the science teachers in all case-study schools desired to work individually and free from any classroom scrutiny, and everyone seemed to be unwilling to expose her/his classroom practices to colleagues. Drawing on the findings in Chapter 5, one example of statements for this issue included, "*If discussions about whether, or not, I have pedagogical concerns were carried out in the one-to-one context, it would be easier for me to talk freely [about my implementation concerns]*" (Batuli). That is to say, the interactions among the science teachers and with SBLs were characterised by what Ornstein and Hunkins (2004) and Little (1982) referred to as 'the norms of privacy and independent teaching'. Even in the HPS and MPS where pedagogical discussion seemed to evolve, interactions often stopped short off an invitation to observe one's teaching processes. All SBLs in all case study schools complained that some science teachers did not seem to be comfortable with attempts to observe their implementations. Infrequent requests for very brief advice, according to the findings, were the favoured mode of interaction in all case-study schools.

It is perhaps not surprising to see these findings in these case-study schools. They reflect previous investigations conducted in other African countries (e.g., Manaseh, 2016; Mngomezulu, 2015), all of which revealed the presence of the 'mind your own business' professional lifestyle within schools. Given this situation, we may imagine the difficulty experienced by the SBLs in guiding science teachers' implementation of this curriculum and in influencing them to engage in communities of practices in which they could more easily learn about this curriculum.

The researcher knew little of what had influenced these norms of privacy in the case-study schools. Nevertheless, he was mindful of the fact that perceptions of trust from colleagues is a primary condition for teachers to observe each other (Glickman et al. 2018), communicate (Elving, 2005), and to collaborate (Stoll et al., 2006). Elving (2005) observed that transparency in a school permits instructional leaders to appear

credible and more trustworthy in the eyes of their colleagues. Taken together, this literature may provide clues to what triggered the situation in the case-study schools. It could be that the SBLs in all of the case-study schools were not, as Glickman et al. (2018) argues, transparent in their words and actions nor authentic in the ways they represented themselves to science teachers. That is to say, it is likely that the science teachers' desires to work independently in the case-study schools was influenced by a fear of exposing their teaching qualities to others as these could have damaged their professional status with colleagues and authorities. Therefore, even though the science teachers in the case-study schools did not speak openly about the issue of mistrusting each other, which was perhaps for the fear that such information could be held against them if the exposed by the researcher (Ornstein & Hunkins, 2004), it could be interpreted that their classroom isolation tendencies were attempts to avoid any vulnerability of being perceived as incompetent by their peers and leaders.

The presence of the norm of privacy in HPS and MPS, where the SBLs attempted to encourage communities of practice to master the 2005 Tanzanian ISCS Curriculum, is not particularly surprising. Little (1982) supports the idea that teachers in the same school may differ in their perceptions about an interaction, which thus affects the degree to which they may choose to interact with their colleagues. Schools that can be described as 'collegial', according to Little (1982), may still harbor a few isolated teachers who do not wish to communicate with their peers.

Norms of privacy among science teachers in the LPS was 'strong', possibly because of the staff organisation style. According to Rogers (2014) and Stoll et al. (2006), regular contact fuels trust among members of the organisation. As reported over and over again in this thesis, all teachers in the LPS were randomly allocated to only two staffrooms. Because of this disorganisation, it is likely that the science teachers in this case-study school lacked a common space and time for them to meet and discuss issues that were only specific to the implementation of their subjects.

Overall, the SBLs in this study accepted that trusting relationships with, and among, the staff were the most imperative condition in the establishment of a school culture capable of achieving the successful adoption of the 2005 Tanzanian ISCS

Curriculum. The reviewed literature shows that individual's perception related to trust or mistrust shapes and determine the ways one interacts with colleagues (Elving, 2005; Hallam et al., 2015). The SBLs in all case-study schools mentioned that the science teachers were not happy to be observed. Drawing on the findings presented in Chapter 5, the GAM in the MPS, Bakari, insisted that *"I wish to observe them, but you know; the way they look at me when I walk around it tells me that they have a 'Does it mean he has no trust in me?' kind of attitude"*. In what could be interpreted as an outcome of this perception, the SBLs preferred walkthroughs rather than participant classroom-observations in monitoring the implementation. The SBLs clearly stated that they did not feel free to advise their teachers on teaching matters, and this feeling influenced their leadership as none of them provided the science teachers with any constructive comments in the Lesson Plans and Schemes of Work they inspected. That is to say, the norms of privacy and related mistrust in all case-study schools in part influenced the SBLs' decisions about what, when and where to interact and communicate with staff about this 2005 Tanzanian ISCS Curriculum.

The current study findings reflect and complement the report of Manaseh (2016), and Mngomezulu (2015). Manaseh (2016) for example, examined the instructional leadership practices in some Tanzanian schools and revealed that the SBLs preferred not to observe the teaching processes for fear that it would mean they did not trust their teachers' capacities. In a similar way, SBLs in schools studied by Mngomezulu (2015) in South Africa stopped visiting classrooms for observations because of the unwelcoming body language shown by teachers.

What is signalled in this discussion is the likelihood that the norms of privacy among staff members contributed to a contrived and feigned form of curriculum-adoption leadership in all case-study schools. Likely, even discussions concerning classroom practice were not open fearing the 'defensive routines' that stemmed from the norms of privacy. On these grounds, it could be concluded that the culture of independent teaching driven by a sense of entitlement to privacy in what one does in a classroom blocked the institutionalisation of the 2005 Tanzanian ISCS Curriculum in all of the three case-study schools. These results emphasise the significance of relationships

built upon authentic trust within schools as this is vital to the success of the adoption and related leadership processes.

6.3.3. Instructional barriers

This study found three contextual aspects that likely restricted the science teachers' attempts to adopt the 2005 Tanzanian ISCS Curriculum. These included: the lack of supporting instructional resources, a higher student to teacher ratio; and, concerns about time shortage. The intensity of these concerns varied considerably across the case-study schools.

Consistent with findings by Mtitu (2014) and Nzima (2016), which were also from the studies conducted in Tanzania, the lack of supporting instructional resources and having overcrowded classrooms presented a barrier to the science teachers. Access to resources that could have promoted critical thinking, problem-solving abilities, and which could have stimulated students to communicate their inner thoughts (Semali & Mehta, 2012; Lawson, 2010), was lacking. As detailed previously in Chapter 5, the situation was worse in the LPS, where classrooms had not less than 70 students, and laboratories were critically ill-resourced. The findings of this study illustrate that overcrowded classrooms was a major barrier for the science teachers in the LPS not only to design appropriate hands-on activities but also to guarantee the participation of every student in their teaching processes.

'Time' constraint related to teacher perceptions of the volume of content that they had to teach also appears to be a common factor impeding the adoption of change. Research conducted previously in developing countries (e.g., Nzima, 2016) and in the developed countries (e.g., Fitzgerald et al., 2017) reported the presence of this problem and its impacts on the curriculum adoption. Most science teachers in this study complained that their science syllabuses were too long to the extent that they could hardly cover it if they employed inquiry-based pedagogy. Therefore, they had to revert to teacher-centred instructional methods to save time.

The large-scale uptake of innovations relies heavily on the adopters' perception of the possibility of success in using the suggested approach (Fitzgerald et al., 2017).

Any interest in the change is by itself not sufficient to trigger teachers to attempt to deal with the change. Therefore, the barriers perceived by the science teachers in all three case-study schools likely demoralised them from even attempting to employ the inquiry and student-centred instruction in their classrooms. Indirectly, this issue similarly affected the SBLs' effectiveness in institutionalising the change in schools.

6.3.4. Summary

The success of the SBLs in leading curriculum adoption, according to the findings, was severely constrained by the contextual factors. These included the capacity of the SBLs to lead professional development of the science teachers, norms of privacy, and the classroom environments. Nevertheless, these impediments did not operate in isolation but rather in complex interconnections. Norms of privacy and knowledge of the curriculum likely interacted to influence the SBLs' decisions about what, where, when, and how they provided change-guidance. Therefore, this study has revealed key challenges to leadership and adoption of the 2005 Tanzanian ISCS Curriculum, most of which were not raised by previous studies into the adoption of this change.

The next section discusses how the science teachers in the case-study schools dealt with the 2005 Tanzanian ISCS Curriculum and their concerns in this undertaking, and, in particular, regarding this curriculum. This discussion will also consider how leadership strategies employed in the case-study schools contributed to the science teachers' implementation practices.

6.4. Teachers' levels of implementation and main concerns

This section discusses the findings concerning the science teachers' adoption of the 2005 Tanzanian ISCS Curriculum in the case-study schools. These include their Stages of Concerns (SoC) and Innovation Configuration of implementation of this curriculum. The influence of the adoption leadership and the climate of each case-study schools on the science teachers' concerns about this curriculum and their levels of adoption are also detailed. Therefore, this discussion answers Questions 2 and 3.

6.4.1. Teachers' main concerns

The science teachers in all case-study schools expressed three main concerns in their attempts to adopt the 2005 Tanzanian ISCS Curriculum in their teaching. These are Information, Management, and Collaboration. Nevertheless, the intensity of each of these concerns varied from one to another case-study school, and sometimes among teachers in the same case-study school.

6.4.1.1. *Concerns about Information*

On average, the science teachers in all of the case-study schools indicated a lack of sufficient information concerning the 2005 Tanzanian ISCS Curriculum. One of the reasons for this could be the approach employed to introduce this curriculum.

Ornstein and Hunkins (2004) and Pieters et al. (2019) are of the view that teachers' levels of awareness of an educational program, particularly a curriculum, depend on the extent to which they participated in the process of bringing it about. As described in Chapter 1, this curriculum was centrally developed and then distributed to schools for implementation through a cascading approach (Kopweh, 2014). In addition to the fact that most teachers were not involved in its origination, the science teachers informed that they also had not attended any specific in-service training focusing on the implementation of this curriculum. Given this information, it is not surprising to find that most of them expressed a desire for additional information. Similar findings are reported in the studies conducted in Tanzania by Kopweh (2014) and Nzima (2016).

Perhaps most importantly, most of the participant SBLs were themselves not even trained to get to grips with this curriculum prior to, or early in, its implementation. Given this situation, the SBLs' abilities to provide the science teachers with timely information regarding this curriculum was unquestionably low. Most likely, when approached by their science teachers for clarification, the SBLs themselves had to inquire first to elicit such information from the higher authorities. If this is what actually happened in the case-study schools, then it is not surprising for the science teachers to express desires for more information.

6.4.1.2. *Management Concerns*

According to the SoC findings, the Stage 3-Management concerns were expressed by most of the participant science teachers in the LPS. A few of the science teachers in the HPS and MPS expressed this to be an issue to them. Most importantly, there was much low variation in the intensity of this concern among the science teachers in the LPS, suggesting that their management-related worries were equally intense. It was deemed necessary to discuss this issue given its threat to adoption.

It is not surprising to see science teachers in the LPS perceiving that many contextual problems blocked their attempts to use the 2005 Tanzanian ISCS Curriculum in their classrooms compared with those in the HPS and MPS. The observation data showed that, while the context in all three case-study schools was challenging for the science teachers to use this curriculum, such challenges were more critical in the LPS, where classrooms had more than 70 students and extremely ill-resourced laboratories. That is to say, improving the implementation environment is required to boost adoption of this curriculum in the LPS and other similar schools.

Generally, the lack of supportive infrastructure and conducive classroom context in Tanzanian schools is also reported in studies conducted by Mtitu (2014) and Semali and Mehta (2012). As informed in Chapter 2, public education in Tanzania is free and compulsory from the pre-primary through to junior secondary school level. This has possibly increased the rate of enrolment of students at these levels. Chapter 2 informed us also that the Tanzanian economy is weak, and this, according to Semali and Mehta (2012), has presented challenges for the educational sector in which most schools have experienced a deteriorating supply of supporting instruction resources. Given these circumstances, it is not surprising that the science teachers in the case-study schools expressed intense concerns about the lack of resources to deal with the 2005 Tanzanian ISCS Curriculum.

6.4.1.3. *Collaboration desires*

The science teachers in the HPS and MPS indicated having intense Collaboration concerns compared with those in the LPS. Desiring to work collaboratively during

the adoption of education change is an indication of the growth of the community of practice within schools (Hall & Hord, 2015). As collaboration brings change users together, Hall and Hord (2015) informs that it increases the diffusion of information concerning change by allowing users to share experiences about its implementation. In view of this literature, we may conclude that the collaboration desires indicated by the science teachers in the HPS and MPS were likely for increasing their mastery of the 2005 Tanzanian ISCS Curriculum.

Literature and research show that teachers' degree of collaboration is increased when SBLs attempt to substitute norms of privacy and independent working lifestyles with opportunities to work as a community of shared practice (Harris & Muijs, 2007; Rogers, 2014; Stosich, 2017). Drawing on the change-leadership practice discussed previously in Section 6.2.3, the SBL in the HPS and MPS guided the adoption of the 2005 Tanzanian ISCS Curriculum by exercising less blatant power and, in particular, by nursing collegiality, compared with the SBLs in the LPS. Therefore, we can hypothesise that the collaboration desires demonstrated by the science teachers in these HPS and MPS, as revealed in the SoC profiles, was influenced in part by the positive change-adoption leadership practices.

6.4.2. Configuration of Implementation of Curriculum Components

This study revealed the presence of a high degree of commonality of configuration of implementations of 'critical components' of the 2005 Tanzanian ISCS Curriculum across all three case-study schools. That notwithstanding, some differences were also noted between the case-study schools.

The 2005 Tanzanian ISCS Curriculum recommends teachers to structure instruction in contexts that enhance curiosity and learning among students as well as delivering lessons using inquiry-based and student-centred strategies (MoEVT, 2007). Findings show that there were few cases, especially in the HPS and MPS, where teaching took place outside of the classroom settings or in the laboratories, and this likely nursed inquiry minds of the learners. Lecturing featured alongside low-quality discussions, questioning, demonstration, and highly structured laboratory activities formed the typical instructional landscape of each case-study schools. As summarised in Section

5.5.4.2, most of these instructional activities were structured in a way that largely demanded students to follow and master (memorise) specific procedures designed to confirm known facts. These findings reflect those reported by Mkimbili (2018), Nzima (2016), and Mtitu (2014), which similarly reported the low levels of input of students in the learning processes, high levels of ‘recipe-based’, and what Lawson (2010) refers to as confirmation-inclined laboratory activities. Considering these findings, this study agrees with Mkimbili’s (2018) study findings on that a considerable part of the instructional practices manifested by the science teachers in all of the three case-study schools were mostly for students to attain low levels of inquiry skills, contrary to the intention of the 2005 Tanzanian ISCS Curriculum.

The forgoing interpretation does not mean to say there was no improvement in the adoption of this curriculum in the case-study schools. Rather, as detailed in section 5.5.4.2.2, there appeared to be some good examples of the way the science teachers employed questioning and discussion approaches and how they considered the issue of ‘situated learning’ in the HPS and MPS compared with the LPS. Student-teacher and student-student interactions in the HPS and MPS were promoted through Think-Pair-Share, Gallery walks, Task-partner, and by Buzzy grouping strategies. Also, the research revealed few outdoor and laboratory learning sessions in the HPS and MPS. In the LPS, the study observed absence of any situated learning; the presence of few practical sessions; and, the use of Buzzy group and learning teams as the only means to enhance students’ interactions and engagement in the learning processes.

These findings signal that the science teachers in the HPS and MPS had started to change their teaching style from the traditional approaches to ones relevant to the intentions of the 2005 Tanzania ISCS Curriculum, and which were marginally more advanced in their implementation of this curriculum compared with colleagues in the LPS. Nevertheless, it could be argued that there were also signs of transition in the instructional processes among the science teachers in the LPS, especially given that occasional use of inquiry (e.g., laboratory tasks) and student-centred strategies (e.g., group discussions) were also observed in this case-study school.

It is apparent that Levels of Use and Configurations of Implementation of this 2005 Tanzanian ISCS Curriculum in these case-study schools were due to the influence of numerous factors, and some of which were idiosyncratic in each case-study school. Instructional leadership practices revealed in each case-study school could be one of the factors behind these variations. According to Hall and Hord (2015), the change-leadership landscape is related to Levels of Use and the Innovation Configuration of implementations. Fullan (2014) and Glickman et al. (2018) support this view, stating that the implementation of an educational program is more likely to be improved when adoption leaders combine the use of control with involvement leadership methods. Even though we cannot establish a direct link, we can still hypothesise that the adoption leadership practices revealed in the case-study schools played a role in influencing the science teachers' levels of adoption of the 2005 Tanzanian ISCS Curriculum in their classrooms.

As discussed previously in Section 6.2.2.2, previous studies (e.g., Sagnak, 2016; Somech, 2010; Tam, 2010) indicate an increase in teachers' loyalty to pedagogical decisions when they perceive to be valued and recognised in any decisions regarding the change. Therefore, the synchronised use of the managerial leadership approach, the empowering approach, and the one that nurtured collegiality in the HPS and MPS likely contributed to improving the science teachers' understanding of, and hence, their Levels of Use of, this curriculum compared with the LPS, where the leadership of the implementation of this curriculum was mostly managerial.

Contextual differences also appear to have played a role in these differences in Level of Use and Configuration of Implementation of the curriculum. Lawson (2010) point out that while there is a wide range of teaching approaches to suit inquiry learning, in any particular situation, the choice is limited by, among other factors, class size and availability of supporting facilities. Classroom factors, according to Lawson (2010), explain more than one-third of the variation in teaching among teachers and between schools. The somewhat higher use of student-centred teaching methods in the HPS was likely because this school had reasonable science class-sizes, and well-resourced laboratories compared with the other case-study schools, and more specifically the LPS where classrooms had at least 70 students. Perhaps, if the LPS had a teaching

environment that is comparable to those in the other two case-study schools, and if the support from the SBLs was reasonable, the science teachers would have equally felt at ease to adopt the inquiry and student-centred pedagogies. Generally, it could be argued that the class sizes in the LPS could hardly allow the use of inquiry and student-centred instruction methods as recommended by the 2005 Tanzanian ISCS Curriculum.

6.5. Chapter Summary

This chapter has discussed the main findings related to change leadership practices and teachers' concerns as well as their implementations of the 2005 Tanzanian ISCS Curriculum in the case-study schools. Even though no direct link could be claimed, one could argue logically that there was an influence of the adoption leadership and school climate on the science teachers' SoC and levels of use and implementation of this curriculum in the three case-study schools. The next Chapter concludes this thesis, detailing the limitations of this study while also providing suggestions for future investigations concerning the adoption of this curriculum in these and other schools.

Chapter Seven: Conclusion and Recommendations

7.1. Overview of study

This study is descriptive and embraced premises of the Type IV case-study design. It aimed to depict the leadership practices exhibited by School-Based Leaders (SBLs) in three secondary case-study schools in facilitating the professional development of their science teachers for the adoption of the 2005 Tanzanian Inquiry and Student-Centred Science (ISCS) Curriculum.

The SBLs in all three case-study schools guided and influenced the science teachers' adoption of the 2005 Tanzania ISCS Curriculum with the use of both democratic and autocratic approaches. Democratically, the SBLs: (i) empowered science teachers to decide how they had to proceed with the adoption of this change, and (ii) nurtured collegiality for teachers to support each other. The use of democratic approaches was more typical in the HPS and the MPS and less so in the LPS. The use of managerial approach to leading adoption of the 2005 Tanzanian ISCS Curriculum was common to all case-study schools, but its realisation varied from one to another school as the SBLs employed different pitches of administrative procedures. That is to say, the real landscape of approaches employed by SBLs to guide the adoption of this change varied from one to another case-study school. In fact, this variation was also typical in how the SBLs employed approaches that were common to all case-study schools.

The leadership approaches that placed much emphasis on the communication and sharing of an understanding of this curriculum among the staff members in the case-study schools appeared to be most effective in influencing science teachers to adopt the 2005 Tanzanian ISCS Curriculum. As such, an improved level of adoption of this curriculum was, to a certain extent, ascertained in the case-study schools where the SBLs not only attempted to employ all three adoption-guidance strategies but also were strategic in applying them.

It is common for qualitative research to uncover issues that were not part of its original plan (Creswell, 2014). This study is a case in point. This study revealed that

the efficiency of the adoption leadership was limited by, among other things, the SBLs' capacities as defined by their (i) knowledge of the 2005 Tanzanian ISCS Curriculum and (ii) instructional leadership experience, and the culture of limited professional interactions within a school defined specifically by norms of privacy. The science teachers' adoption of this curriculum was limited considerably by the scarcity of instructional resources and by class size factors. Given these limitations, changing the teachers' perceptions about the value and practicality of the instruction approaches suggested by the 2005 Tanzanian ISCS Curriculum was likely difficult for the SBLs.

7.2. Implications for policy and practice

The reviewed literature informs us that the successful adoption of new educational program is, among others, influenced by the nature of school leadership. This study extends this literature. It reports practices employed by the school-based leaders in guiding the science teachers' adoption of change, in particular, the 2005 Tanzanian Inquiry and Student-Centred Curriculum, and the effectiveness of such practices in influencing the implementation of this curriculum by science teachers in three case-study schools. Additionally, this study reports the contextual factors that influenced or limited both leadership of adoption and implementation of this curriculum in the case-study schools. While these findings are to be understood within the contexts of the three studied case-study schools, their implications can extend to other schools in Tanzania. Moreover, these findings provide valuable implications to other education stakeholders in Tanzania and, in particular, the Tanzanian Ministry of Education. These findings also contribute to the discussion and theory about the change process. These implications are presented below.

7.2.1. Implications for curriculum developers in Tanzania

The current study findings showed clearly that the SBLs lacked enough knowledge of the 2005 Tanzanian ISCS Curriculum and had inadequate instructional leadership skills to lead its adoption. This situation presented challenges for them to guide the adoption of this curriculum. This information is a call for the Tanzanian Ministry of Education to organise in-service professional development programs to equip SBLs

with the necessary knowledge of this curriculum. Such training should also aim at providing SBLs with experiences on how best to guide this change in their schools. These professional development opportunities should equally be for science teachers who, according to the findings of this study, desired, among other things, additional information concerning this curriculum. The lack of information was a major barrier for them to transit from the previous to this curriculum.

Professional development to support SBLs and science teachers to be adept at this curriculum and its implementation is especially critical because of the weakness of the cascading practice employed to diffuse the philosophy of this curriculum in the Tanzanian schools. According to Kopweh (2014), the sketchy professional training that the Tanzanian Institute of Education provided to teachers and SBLs in relation to this change did not work well not only because the ideals of this new curriculum got diluted while dripping down the chain, but also because few of the teachers and school leaders had attended such training. As can be seen in this study, the failure to train the SBLs and science teachers resulted in what was akin to ‘the blind leading the blind’.

Another implication is related to the mismatch between school contexts and the 2005 Tanzanian ISCS Curriculum design. The quality and quantity of infrastructure and class sizes had impacts on, and a reason for differences in, the level of adoption of this change in the case-study school. The circumstance in the HPS and MPS allowed the science teachers to implement this curriculum with little difficulty compared with those in the LPS. This shows that schools that are most advantaged are the first to adopt educational change compared to the less-advantaged ones, creating an even greater gap between schools. The implication here is clearly for the Tanzanian Government to improve the teaching environment and ensure the situation is fair in all schools. Improving laboratories, classrooms, and other necessary resources is, perhaps, an unthreatening approach to inspiring science teachers to adopt this curriculum. This improvement will, unfortunately, require a greater deal of expenditure by the central Tanzanian government and its local authorities.

7.2.2. Implications for School-Based Leaders

Although the autocratic approach to adoption leadership is sometimes useful, the current study findings attest that it works well only when strategically applied to complement democratic approaches. The SBLs in the LPS were too authoritative compared with those in the HPS and MPS in their leadership of the adoption of the 2005 Tanzanian ISCS Curriculum. Likely, this is what contributed to differences in the science teachers' stages of concerns and levels of adoption of this curriculum in the three case-study schools. Therefore, SBLs in Tanzanian secondary schools are called upon to be careful about the variety of strategies they opt to use and how they use them in guiding the adoption of this curriculum and other educational programs in their schools.

The effectiveness of leadership of curriculum adoption, according to these findings, increases when leaders consult and collaborate with individuals who are not part of the school management. In the HPS, where experienced teachers from within and outside the school were consulted, managing the curriculum adoption appeared to be a smoother process compared with other case-study schools, particularly the LPS, where control and command shaped the distinctive landscape of curriculum adoption leadership. These findings remind SBLs to be aware of the value of the contribution they might gain from experienced colleagues, in particular from within their schools, and to consider consulting and or involving them in pedagogical leadership. SBLs can use these findings for reflection and improvement of their curriculum-adoption leadership in their schools.

7.3. The study limitations and recommendations

The findings of this study enrich the theory about the adoption of innovation and its leadership. That notwithstanding, there were limitations. This section details them, thereby paving way for further studies to extend our knowledge regarding the issues revealed in this study.

7.3.1. Generalisability issue

The case-study design employed in this study limits the generalisability of findings. First, it should be clear that the case-study schools were not representative samples. Rather, they were purposefully selected as typical ‘settings’ from a broad range of Tanzanian secondary schools to permit the researcher to undertake an informative investigation and generate rich data about change-related processes. This research aimed at exploring each of these case-study schools but paying more attention to the science teachers’ lived experiences concerning the adoption leadership practices, and to determine if a typical change-leadership model fitting attributes demonstrated by the SBLs in each or most of these case-study schools could be generated. Second, the use of the descriptive perspective in analysing the data collected during this study implies that what the researcher interpreted and perceived to be valid is negotiable. This is based on the fact that there can be multiple and varying claims to knowledge from the collected data.

Considering these arguments, findings reported in this study cannot be generalised to all Tanzanian schools. While many of the circumstances described in this study may resonate well with the experience of teachers in other secondary school settings, they should apply these findings with caution.

Therefore, other studies are recommended to include a substantial number of schools and use alternative ways to establish the validity of interpretation of any findings. These ideas could strengthen the findings of this study concerning the curriculum leadership practices in Tanzanian secondary schools and improve the contribution advanced by this research to generate a broader knowledge of the change-adoption leadership in schools.

7.3.2. Mortality issue

School principals in all case-study schools agreed to participate in a study. However, for good reasons such as absence of these leaders in some cases, they did not attend interviews. It may be that they were not willing to be interviewed concerning these issues because they perceived themselves as having nothing to contribute. If this was

a valid reason, one could infer that impacts of these SBLs on the leadership of adoption of the 2005 Tanzanian ISCS Curriculum in their schools was very limited. Alternatively, it could be that the principals of the three examined case-study schools were just not interested in this study.

To ensure that findings concerning their change-adoption leadership practice, if any, in the case-study schools were included, other sources of data were examined. These sources were document reviews and interviews involving teachers and other school-based leaders. That notwithstanding, one may still argue that the principals' own verbal opinions were essential to validate evidence collected using other strategies regarding their adoption leadership. Considering principal's views was important because teachers and even executive assistants may sometimes be reluctant to disclose issues which they perceive to be critical of their head of school. Given that the current findings can be criticised on the grounds that they present an incomplete picture of the 'management' in each case-study school, other research is recommended to ensure it also interviews all of the SBLs. Information elicited from principals could: (i) complement opinions of other staff-members about the adoption leadership practices, and (ii) be used for comparing what principals say about their own adoption leadership practices with how other staff-members in a school view it.

7.3.3. Instrumentation issue

This study adopted the Concern-Based Adoption Model (CBAM) to investigate the science teachers' level of adoption of the 2005 Tanzanian ISCS Curriculum and their main concerns in adopting this curriculum in the three Tanzanian secondary schools. This model recommends that researchers employ specific techniques and instruments to carry out change-related investigations. To a certain extent, the way in which this study employed this model presents critical limitations.

The first issue is concerning the Stage of Concern Questionnaire (SoCQ). This study adapted and translated the original SoCQ into Kiswahili. However, the reliability and validity of this Kiswahili SoCQ version were not tested before it was used to collect the data. The major reason for not proceeding in this way lies in the low number of science teachers who provided data in the SoCQ (N=12). Even though the researcher

secured the linguistic equivalence, he was still uncertain about whether, or not, there was variation in the meanings interpreted by the participants and those he intended in the translated SoCQ. Likely, the failure to measure the reliability and validity of this SoCQ-translation produced ‘cultural equivalence’ threats, leading to critical research flaws. As such, the science teachers’ levels of concern reported in this study are to be treated with some degree of caution.

On the grounds of these threats, further studies are suggested to use both the original English-SoCQ as well as the translated version to investigate if there is any disparity in findings they produce. However, since the use of a translated SoCQ is sometimes inevitable, researchers interested in the use of this instrument should gauge both the reliability and validity of their translation before they apply to examine the concerns of teachers with the adoption process. Replicating this study by considering these suggestions can be done in these case-study schools or other schools in Tanzania to generate a large enough number of responses before testing the statistical nature of its reliability and validity.

The second instrumentation issue was regarding the techniques employed to gauge the participant teachers’ Levels of Use and their Configuration of Implementation of the 2005 Tanzanian ISCS Curriculum. Because of financial constraints where the researcher was based in Perth, Australia, and the study was conducted in Tanzania, this study could not employ the specific in-depth Level of Use focussed interviews nor generate an Innovation Configuration checklist. Rather, this study deliberately employed interview questions that tapped into both of these domains. Ideally, the CBAM procedures are highly recommended in comprehensive studies such as this. Therefore, the researcher’s failure to embrace these recommended methods in this study has potentially limited the present findings.

Future studies of the Configuration of Implementation of the 2005 Tanzanian ISCS Curriculum are recommended to involve both the users and developers of this new curriculum to develop a reliable word-picture description of what this innovation looks like in practice. When the Configuration of Implementation Map for this new curriculum is developed based on these procedures, it allows researchers to perform

trustworthy evaluations of how far the teachers' implementation is from the ideal practices.

7.4. Opportunities for future research

This study examined the influence of change leadership practices exhibited by SBLs on science teachers' adoption of the new curriculum, the 2005 Tanzanian ISCS Curriculum. To improve our understanding and create opportunity for more effective interventions for improving the implementation of this innovation, the knowledge generated, and issues uncovered by this study need to be extended and strengthened. Considering both the findings reported and the related limitations discussed above, future research might take the following three paths.

First, it is recommended to repeat this study in other school contexts or extend it to cover a broader range of school-contexts, for example, in remote rural areas of Tanzania. This suggestion is based on the fact that the current study was conducted in only three case-study schools located within the urban area of Morogoro, Tanzania. Given that there are considerable differences among schools in different regions and between urban and rural areas in Tanzania, it is essential to know whether the findings revealed in this study would be different or the same in secondary schools located in other regions of the country. We need to know whether, or not, the progress and problems uncovered by this study concerning the leadership of adoption of the 2005 Tanzanian ISCS Curriculum and its influence in the implementation of this innovation are also experienced by SBLs and science teachers in different school-contexts in Tanzania. Knowing how widespread the situation is could help us to determine if we could generate typical models describing (i) change-leadership attributes of SBLs and (ii) change-implementation practices of science teachers in Tanzania. Most importantly, such knowledge will further help us plan for interventions appropriate for a wide range of schools in Tanzania.

Second, although this study has provided us with useful information concerning adoption leadership and its influence on science teachers' concerns about, and their use of, the 2005 Tanzanian ISCS Curriculum, we still lack information concerning the way both SBLs and science teachers understand and perceive this innovation.

This knowledge is essential given that their involvement in bringing about this innovation was low as it was imposed on them by the Tanzanian Government. Literature informs us that leaders' understanding of an innovation influences the way in which they lead its adoption, while the understanding of users influences the way they deal with it. Thus, knowing SBLs' and science teachers' levels of understanding of the 2005 Tanzanian ISCS Curriculum could allow us to make sensible predictions of the levels of the leadership and adoption processes involved in dealing with this innovation. Importantly, this information could allow us to predict the influence of SBLs on science teachers and the difficulties involved as the two working levels interact in dealing with this change. These could enrich our knowledge concerning the transition processes involved in this innovation.

The third avenue for future study comes from the research approach aspect. This study employed a qualitative approach to describe transition-related experience of SBLs and science teachers and the impact of their interactions in dealing with the 2005 Tanzanian ISCS Curriculum. A quantitative methodology could be employed to investigate a larger sample of schools, their SBLs and teachers as this will lead to findings that could be generalised to the entire system within Tanzania.

7.5. Thesis closure

This study originated from the researcher's experiences in various education reforms in Tanzania and, in particular, the 2005 Tanzanian Student-Centred Science (ISCS) Curriculum. This study investigated leadership practices exhibited by School-Based Leaders in enabling the professional development of science teachers for adopting the 2005 Tanzanian ISCS Curriculum in three case-study schools.

The findings have shown how both teachers and school-based leaders attempted to deal with this curriculum and challenges that impeded both of them. By considering the findings, the researcher concludes using Gerver's (2010) opinion that inadequate levels of support provided to teachers at times of education change is what in part fails them (teachers) to execute the changes that are so necessary. These findings imply that there is much to be done by the Tanzanian Government, and particularly

by the Tanzanian Institute of Education, in the realms of professional development for both science teachers and school leaders in relation to this curriculum.

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APPENDIX 1

Semi-structured interview schedule for probing change-adoption leadership practice

(For interviewing science teachers)

Date: _____ **Time: From** _____ **to** _____

Part 1: Introduction

The researcher will start by introducing himself to the participant. He will then explain the objectives of the study and remind the participant concerning agreed ethical issues signed in the consent form and how these will be respected during the interview. This opportunity will also be used to discuss with the participant about the researcher's desire to audiotape the conversation, the underlying reasons, and ask whether s/he is willing to be audio-recorded or not. The researcher will finally remind the participant about her/his freedom to use Kiswahili and/or English language during the interview, and that s/he is also allowed not to respond to any of the questions in case s/he feel to do so.

Part 2: Teacher's introduction and background

Would you mind telling me a little about yourself as a science teacher?

- How long have you been teaching science?
- How long have you been working in this school?
- How long have you been teaching under the present school leadership?

Part 3: Issues related to SBL's change facilitation

(i) Teacher's perception of her/his own concerns

- What would you say are your biggest challenges in relation to the implementation of the 2005 Science Curriculum?
- On your opinion, how often do you come across with these problems in a term: once, twice, monthly, weekly or daily?

(ii) Teacher's perception about SBLs' awareness of the teachers' concerns

Do you think that your school-leaders (Principal, GAM, HoDs) are aware of the challenges that you have been going through in regard to the implementation of the 2005 curriculum?

- If No: what do you think prevents SBLs from being aware of your concerns?
- If Yes:
 - Can you tell me which of the previously mentioned concerns you think are well known to your leaders?
 - In your opinion, why do you think SBLs are aware of only some of these concerns rather than all of them?

(iii) Teacher's opinion about change facilitation actions and events

Based on your experience, do you think SBLs here take any measures to find out whether or not you and other teachers are implementing the 2005 curriculum as required in this school? Or, even to find out your strength and weakness in relation to the implementation of the 2005 Science Curriculum?

- **If NO.**
 - What do you think are the reasons that make them fail to do so?
 - What measures, if any, did you take to let them know about your teaching-related problems, challenges, and weakness?
- **If YES:**
 - Do you mind describing to me the strategies that the SBLs have used thus far to find out your teaching-related concerns?
 - How often did SBLs use these strategies to monitor the way you are teaching students in a term: once, twice, monthly, weekly or daily?
 - In which location do you think was the intervention often conducted: in the office, in the classroom, or anywhere else (mention)?
 - Do you think that there are other more efficient strategies that could have helped the SBLs to uncover your concerns compared to the ones that they have been employing so far?
 - Would you mind talking a little about them?
 - Why do you think that the strategies you are suggesting would have been more useful to the SBLs compared to those that they have been prominently using so far?

(iv) Teacher's opinion about the way they are guided by the SBLs

- Can you tell me something related to the feedback that you have been receiving from the SBLs following their teaching-related supervision?
- Has your school organised any workshop, training or even a meeting in which you could discuss issues concerning implementation of the 2005 Tanzanian Curriculum?
- Based on your experience, what are the main ways used by the leaders to provide the guiding-feedback to you (*orally, in writings, using reprimands, giving prizes, a combination of these*)?
- Which of the teaching approaches do you think were mostly emphasised by SBLs when guiding the ways to implement the 2005 Science Curriculum?
- What is your general opinion concerning the nature of the feedback that you received thus far? Is it more about *content or methodology*?

Part 4: General questions

- Based on your opinion, to what extent do you think that the leaders in your school are knowledgeable of the changes introduced in the new curriculum?

- At this point, what are the biggest needs for you to progress with the implementation?
- Generally, do you feel satisfied with the way the SBLs monitored your curriculum implementation practice?

Part 5: Conclusion

In relation to what we have covered here today:

- Are there any other issues you would like to raise?
- Are there any questions you would like to ask?

Thanksgiving:

The participant is thanked for her/his participation and reminded that they will receive a copy of the interview transcript for their approval as soon as possible.

KIAMBATISHO CHA 1

**Muundo wa Mahojiano Kuhusu Namna Ambavyo Viongozi wa Shule
Wanavyowaongoza Waalimu Kuutekeleza Mtaala Mpya**

(Mahojiano haya yatamhusisha mwalimu wa masomo ya sayansi)

Tarehe: _____ **Muda: kuanza** _____ **kumaliza** _____

Sehemu ya 1: utangulizi

Kabla ya kufanya chochote, mtafiti atajitambulisha yeye mwenyewe mbele ya mshiriki wa tafiti hii, ambaye kwa muktadha huu ndiye mtoa taarifa. Baada ya kujitambulisha, mtafiti atamjulisha mshiriki wa tafiti hii juu ya malengo ya tafiti yenyewe na namna ambavyo maadili mbalimbali ya kitafiti yatazingatiwa wakati wote wa mahojiano na hata baada ya hapo. Kimsingi, hii itakuwa ni kukumbushana tu kwani maadili hayo yote yatakuwa tayari yalishafanyiwa makubaliano wakati ambao mshiriki alisaini fomu maalumu ya kuridhia kushiriki katika tafiti hii. Pamoja na kuungumzia juu ya misingi mbalimbali ya maadili ya kitafiti ambayo yatazingatiwa, mtafiti atatumia wasaa huu kumuomba mshiriki ruhusa ya kurekodi mazungumzo yote kwenye karatasi na kwa kutumia vinaso sauti. Madhumuni ya kurekodi mazungumzo hayo pia yataelezwa. Mwisho kabisa, mshiriki (mtoa taarifa) atakumbushwa juu ya uhuru wa kutumia lugha yoyote kati ya Kiswahili na Kiingereza wakati wa mahojiano.

Sehemu ya 2: Taarifa za utambulisho wa mwalimu

Je, unaweza kuniambia machache kukuhusu wewe mwenyewe kama mwalimu wa sayansi?

- Ni kwa muda gani sasa umekuwa kufundisha sayansi?
- Ni kwa muda gani sasa umekuwa ukifundisha katika shule hii?
- Ni kwa muda gani umekuwa kufundisha chini ya uongozi wa sasa wa shule?

Sehemu ya 3:

i. Mtazamo wa mwalimu juu ya changamoto na wasiwasi anaoupata katika kuutekeleza mtaala

1. Tafadhali, unaweza kunieleza changamoto zozote, kama zipo, ambazo umekuwa ukikutana nazo wakati ukiutekeleza mtaala mpya wa elimu wa mwaka 2005?

- Kadiri ya uzoefu ulionao, unadhan changamoto hizi zinahusiana zaidi na mbinu za ufundishaji au ni ubobezi usiordhisha wa maudhui ya somo lenyewe?
- Kwa mtazamo wako, unadhan unakutana na hizi changamoto mara ngapi katika muhula: mara moja tu, mbili tu, mara moja kwa kila wiki, au mara moja kwa mwezi?

ii. Mtazamo wa mwalimu kuhusiana na namna ambavyo viongozi wa shule wanavyoyafaham matatizo na changamoto za waalimu katika ufundishaji

2. Unadhan viongozi wa shule wanafahamu changamoto ambazo umekuwa ukikutananazo kuhusiana na utekelezaji wa mtaala mpya?

- Kama jibu lako ni **HAPANA**: unadhan nini kinasababisha wasizifahamu changamoto zako?
- Kama jibu lako ni **NDIYO**:
 - Unaweza kuelezea moja ya changamoto ulizozitaja ambazo unadhani viongozi wa shule wanazifahamu kuwa unakutana nazo?
 - Kwa maoni yako, ni kwa nini unadhan viongozi wa shule wanaufaham wa hizi changamoto chache na sio zote?

iii. Maoni ya mwalimu kuhusu matendo na matukio mbalimbali yanayotekelezwa na viongozi wa shule kwa lengo la kuwezesha waalimu kutekeleza mtaala mpya

3. Kulingana na uzoefu wako, unadhan viongozi wa shule hii wana ujuzi wa kutosha wa kuchunguza na kufuatilia changamoto za ufundishaji za waalimu?

- Ikiwa jibu ni **HAPANA**:
 - Unadhani nini kinaweza kuwa kinasababisha viongozi wa shule washindwe kutekeleza jukumu hili?
 - Wewe binafsi umefanya jitihada gani ili kuhakikisha kuwa viongozi wa shule wanazifaham changamoto unazokutananazo?
- Ikiwa jibu ni **NDIYO**:
 - Unawez kuzielezea mbinu mbalimbali ambazo viongozi hao wanazitumia katika kubaini changamoto ambazo unakutana nazo katika ufundishaji?
 - Unadhan ni mara ngapi viongozi huwa wanazitumia mbinu hizo katika mhula: mara moja, mbili, kwa mwezi, kila week au kila siku?
 - Kati ya ofisini, darasani na kwenye vikao vya shule: ni wapi mara nyingi huwa mnazungumzia mambo yahasuyo mtaala mpya?
 - Ukilinganisha na mbinu ambazo viongozi wa shule wamekuwa wakizitumia kubaini changamoto za waalimu katika kuutekeleza mtaala hadi sasa, unadhan kuna mbinu nyingine mbadala, ambazo zinaweza kuleta ufanisi zaidi?
 - Unaweza kuzielezea kidogo?
 - Unadhan ni kwa nini mbinu hizi zingeweza kuwa na ufanisi Zaidi ukilinganisha na zile ambazo wamekuwa wakizitumia hadi sasa?

iv. Maoni ya mwalimu kuhusiana na mrejesho anaoupata kutoka kwa viongozi wa shale

- Unaweza kuelezea chochote kuhusu mrejesho unaoupata kutoka kwa viongozi wa shule baada ya kufuatilia na kuchunguza ubora wa ufundishaji?
- Je, shule yako imewahi kuandaa semina au kongamano la ndani kwa lengo la kuzungumzia utekelezaji wa mtaala mpya?
- Kwa uzoefu wako, ni njia zipi kuu ambazo zinatumiwa na viongozi wako wa shule katika kukupatia mrejesho na kukuongoza kuhusu ufundishaji (*kwa mdomo, kupitia adhabu, zawadi au ni muunganiko wa hizi*)?
- Kati ya mbinu mbalimbali za kufundisha, ni zipi unadhani viongozi wa shule huwa wanazisisitiza sana hapa?
- Una maoni gani kuhusiana na asili ya mrejesho unaoupata?
 - Je, unajikita Zaidi kuzungumzia mbinu za ufundishaji au maudhui ya somo?
 - Ukizingatia aina ya changamoto zako katika ufundishaji, unadhan ni kwa namna gani mrejesho unaoupata toka kwa viongozi unakusaidia kupunguza kiwango cha changamoto zako?

Sehem ya 4: Maswali ya jumla

- Kwa maoni yako, unadhani ni kwa kiwango gani viongozi wa shule wana uelewa wa mabadiliko yaliyotokana na mtaala mpya ukilinganisha na ule wa zamani?
- Ni kwa namna gani unadhani uwezesaji umekusaidia kuhama kutoka ufundishaji ambao ulifaa kwa mtaala wa zamani kufikia ufundishaji unaoendana na mtaala wa sasa?
- Kwa ujumla, unadhani unaridhishwa na jinsi ambavyo viongozi wanakusaidia kuboresha utekelezaji wako wa mtaala mpya?

Sehemu ya 5: Hitimisho

Kuhusiana na haya yote tuliyoyazungumza leo hapa:

- ❖ Kuna jambo lolote ambalo halijagusiwa ambalo ungependa kutiongelea?
- ❖ Kuna swali lolote ambalo ungependa nilijibu?

Mshiriki wa tafiti (mtoa taarifa) anashukuriwa kwa kushiriki kakika mahojiano. Pia anataarifiwa kuwa ataletewa nakala ya kile kilichozungumzwa na tafsiri yoyote itakayofanywa na mtafiti ili afanye uhakiki wa mwisho.

APPENDIX 2

Semi-structured interview schedule for probing change-adoption leadership practice (For interviewing school-based leaders)

Date: ____ / ____ 2017

Time: ____ hrs ____ min

Part 1. Greeting and introduction

To put the informants at ease, the researcher will:

- (iv). Introduce himself again to the participant
- (v). Re-explain the purpose and structure of the interview.
- (vi). Re-explain confidentiality and anonymity agreements and assure the participant that these will be observed.
- (vii). Re-inform participants about their freedom to use either Kiswahili or English or both during the interview.
- (viii). Request participants if they allow being recorded on audio and remind them why he wishes to do so.

Part 2. Background and identity of the school-based change facilitator

Is it ok for you to tell me a little about yourself?

- When did you become a leader in this school?
- How many schools have you served in this responsibility?
- How many years did you teach before you were appointed to shoulder this role?

Part 3. Curriculum change management practice

(i) SBLs' awareness about the teachers' concerns

Based on your experience as an instructional leader, do you think that science teachers in this school still need support to influence them use the inquiry and student-centred instructional practices as recommended by the 2005 Tanzanian Science Curriculum?

- Can you describe the main teaching-related 'concerns' that you think the teachers have with regard to the implementation of the 2005 Tanzanian Science curriculum?
- Do you think these concerns are more about the content or the pedagogy?
- In your opinion, do you think that the intensity of these concerns has decreased or increased; or, have they remained the same since the commencement of the 2005 Tanzanian Science Curriculum?

(ii) Means used to uncover the teachers' concerns

- ❖ Can you tell me a little about the means (actions and events) that you believe have helped you to uncover the teaching-related concerns of the teachers in your school?

- Based on your experience, which of these strategies do you think you use more frequently when you are exploring the teachers' concerns in your school?
 - If you are to rate yourself, how many times do you think you have applied these strategies every term: once, twice, monthly, weekly, or daily?
 - When you are investigating teachers' concerns about the implementation: what type of evidence are you often looking for?
 - On your opinion, do you think these strategies have helped you to uncover all of the concerns that teachers are undergoing here?
- Where often do you conduct this search: in the office, in the classroom, or anywhere else?
 - Can you tell me the reason that influences you to carry out your search in these (this) settings?
- ❖ Are you comfortable telling me about any other alternative strategy, if any, that you might consider using in the future to uncover teachers' concern, which you might have not succeeded in uncovering so far?
 - Would you mind telling me what actually led you to think of this/these strategy/strategies?
 - What do you think are the factors that prevented you from using these strategies in the past?

(iii) Means used to address the teachers' concerns

- ❖ Have you ever addressed any of your teachers' concern about the implementation of this new curriculum (NOTE: it can be you personally or in collaboration with other leaders)?
 - **If NO:** What do you think were factor(s) that blocked you from performing this role?
 - **If YES.**
 - Can you tell me about the nature of activities that you have previously organised for the purpose of guiding the science teachers to implement the 2005 Tanzanian Curriculum accordingly?
 - Approximately, how many times did you apply these strategies every term: once, twice, monthly, weekly, or daily?
 - Where often did you hold such occasions?
 - Do you do think you often did it on one-to-one or you largely involved a group of teachers?
 - Can you share your experience regarding the efficiency of these strategies?
- ❖ Do you mind sharing to me about any other alternative strategy, if any, which you wish to use in the future to address the teachers' concern?
 - What is it that you think has influenced you to opt using these strategies in the future?

- Can you tell me the things that have prevented you from using these strategies in the past?
- ❖ In your opinion, what would you describe to be the nature of interaction between you and the teachers concerning teaching/curriculum related issues?
 - How frequently do you discuss issues about the implementation of the 2005 Science Curriculum?
 - Who often do you think initiates these discussions?
 - Where do you often conduct your discussions?
 - To what extent do you think are the teachers free to interact and share the curriculum-related insights and/or challenges with you?
 - Do you think there is any policy or specific strategy in your school that is specifically designed to foster pedagogical discussions among the staff? If YES, do you mind explaining that policy?

Part 4: General questions

- ❖ In general, do you feel positive about the level of transition that your teachers have been showing as they attempt to implement the new curriculum?
- ❖ Based on your experience, how has the current curriculum reform in Tanzania changed the practice of teaching science?
- ❖ Are you happy to tell me about any differences that you know between the previous curriculum and the current 2005 curriculum?
- ❖ Please tell me about any course/seminar/training that you ever attended concerning issues related to the 2005 Tanzanian secondary school curriculum?
 - Based on your memory, how many training occasions of this kind have you attended since you became a school leader?
 - In your opinion, what are the key issues that were covered in such training session/sessions, especially in relation to the implementation of the 2005 Tanzanian Secondary School Curriculum?
 - How do you think these training workshops have helped you to improve your instructional guidance skills?

Part 6: Conclusion:

In relation to what we have covered here today:

- Are there any other issues that you would like to discuss or share regarding your role as a curriculum implementation guider?
- Are there any questions you would like to ask?
- Would you mind if I invite you again for further discussions about these same issues?

Closing:

The participant is thanked for her/his participation and reminded that they will receive a copy of the interview transcript for their approval as soon as possible.

KIAMBATISHO CHA 2

Muundo wa mahojiano yatakayomhusisha kiongozi wa shule kuhusu namna anavyowaongoza waalimu kufundisha kadiri ya matakwa ya mtaala mpya

Tarehe: _____ **Muda** _____ **hadi** _____

Sehemu ya 1: Utangulizi

Katika hatua hii, mtafiti atajitambulisha na kuelezea madhumuni ya mahojiano. Nafasi hii pia itatumiwa kumweleza mtoa taarifa (mshiriki wa tafiti) juu ya mwendendo wa mahojiano utakavokuwa. Hii ni pamoja na kuelezea namna ambavyo maadili ya kitafiti yatakavyozingatiwa wakati na baada ya mahojiano kukamilika. Zaidi ya hayo, mshiriki wa tafiti atafahamishwa juu ya uhuru na uwezekano wa kutumia yoyote kati ya lugha ya Kiswahili na Kiingereza wakati wa mahojiano. Mwisho kabisa, mshiriki ataombwa ruhusa ya kurekodi mazungumzo yote kupitia kinasa sauti na karatasi. Madhumuni ya kurekodi mazungumzo na namna rekodi zitakavyotunzwa yataelezwa, ili kumwondolea hofu mtoa taarifa.

Sehemu ya 2: Utambulisho wa kitangulinzi wa mwezeshaji

- Je, unaweza kunielezea machache kuhusu wewe mwenyewe?
 - Lini uliteuliwa kuwa kiongozi wa shule?
 - Umetumikia cheo hiki katika shule ngapi?
 - Kabla hujateuliwa kushika wadhifa huu, unaweza kuniambia ulikuwa na uzoefu wa kufundisha kwa miaka mingapi?

Sehemu ya 3: Namna waalimu wanavyoongozwa kukabiliana na mabadiliko ya mtaala

(i) Ufahamu wa kiongozi kuhusu changamoto za waalimu

Kulingana na uzoefu wako kama kiongozi wa shule, unadhan waalimu wa shule hii wanahitaji kuongozwa kwa namna fulani ili kuwafanya wafundishe kadiri ya matakwa ya mtaala mpya?

- Unaweza kuelezea changamoto za kiufundishaji ambazo unadhan waalimu wa hapa wanakutana nazo wakati wanautekeleza mtaala mpya?
- Unadhan changamoto hizo zimejikita Zaidi kuhusiana na maudhui ya somo au hasahasa zinatokana na udhaifu wa mbinu za kufundisha?
- Kwa maoni yako, unadhan kiwango cha changamoto hizi kimekuwa kinapungua mwaka hadi mwaka au kinaongezeka; au, unadhani kimebaki katika kiwango kilekile?

(ii) Njia anazotumia kiongozi kugundua changamoto za waalimu

Unaweza kuniambia chochote kuhusu mbinu ambazo umekuwa ukizitumia na ambazo unaaamini zimekusaidia kugundua changamoto za kiufundishaji wa mtaala huu ambazo waalimu wa hapa wanazipitia?

- Kwa uzoefu wako, unadhan ni zipi kati ya mbinu hizo zimekuwa ukizitumia mara kwa mara?
- Kwa wastani, unadhan ni mara ngapi umekuwa ukizitumia mbinu hizi katika mhula: *mara moja au mbili katika mhula; au, ni mara moja kwa mwezi, wiki au ni kila siku?*
- Unapokuwa unatafiti kama waalimu wanapata changamoto au la. Je, huwa unatumia vigezo vipi?
- Unadhan ni kwa kiwango gani mbinu hizo zimekusaidia kufikia malengo ya kubaini changamoto za utekelezaji wa mtaala mpya kwa waalimu wa hapa?
- Ni mahali gani kati ya ofisini au darasani ambapo huwa unafanyia shughuli hizi za kubaini madhaifu na changamoto ya waalimu?

Je, kuna mbinu mbadala za kubaini changamoto za kiufundishaji, hasa katika kuutekeleza mtaala mpya, ambazo unafikiria kuzitumia siku zijazo ili kubaini changamoto tofauti na ulizokwisha zibaini?

- Unaweza kuniambia ni jambo gani limekusukuma kufikiria kuzitumia mbinu hizo?
- Ni mambo gani unadhan yalikuza kuzitumia mbinu hizi siku za nyuma?

(iii) Mbinu anazotumia kushughulikia changamoto za waalimu

Je, umewahi kumsaidia mwalimu kutatua/kuzikabili changamoto za kiufundishaji ambazo anakutana nazo wakati anautekeleza mtaala mpya?

- Kama ni **HAPANA**: Unadhan ni kitu gani kimekuwa kikikuzuia kutekeleza wajibu huo?
- Kama ni **NDIYO**:
 - Unaweza kuniambia chochote kuhusiana na jitihada mbalimbali ulizowahi kuzichukua katika kuhakikisha unawasaidia waalimu wa sayansi wanafundisha kadiri ya matakwa ya mtaala mpya?
 - Unadhan umefanya hivi mara ngapi katika muhula: mara moja, mbili, mara moja kwa mwezi, kila wili au kila siku?
 - Wapi hasa huwa unafanyia uchunguzi huo?
 - Unazungumzia juu ya mafanikio uliyoyapata kwa kuzitumia mbinu hizo?

Je, kuna mbinu mbadala za kubaini changamoto za kiufundishaji, hasa katika kuutekeleza mtaala mpya, ambazo unafikiria kuzitumia siku zijazo ili kubaini changamoto tofauti na ulizokwisha zibaini?

- Unaweza kuniambia ni jambo gani limekusukuma kufikiria kuzitumia mbinu hizo?

- Ni mambo gani unadhan yalikuzuia kuzitumia mbinu hizi siku za nyuma?

Tafadhali, unaweza kuniambia chochote kuhusu namna ambavyo mnawasiliana kati yako na waalimu kuhusu ufundishaji wa mtaala mpya?

- Ni wastani wa mara ngapi huwa mnajadili mambo yahasuyo mtaala mpya katika mhula: mara moja, mbili, mara moja kwa mwezi, kila wili au kila siku?
- Mara nyingi nani huwa anaanzisha mijadala hiyo: nyie viongozi au waalimu?
- Ni wapi hasa huwa mnafanyia mijadala hiyo?
- Ni kwa kiwango gani unadhan waalimu wako huru kujadiliana na wewe kuhusiana na mambo mbalimbali yahasuyo utekelezaji wa mtaala mpya?
- Kuna sera yoyote iliyobuniwa na kutumiwa katika shule yako ambayo inawaongoza juu ya jambo hili?

Sehemu ya 4: Maswali ya jumla

- Kwa ujumla, unaridhishwa na kiwango ambacho waalimu wamehama kutoka ufundishaji ulioendaka na mtaala uliopita kufikia ufundishaji unaohitajika kuutekeleza mtaala wa sasa?
- Kulingana na uzoefu wako, ni kwa namna gani mtaala mpya umebadili hitaji la mbinu za ufundishaji?
- Unaweza kuniambia chochote kuhusiana na tofauti zilizopo kati ya mtaala uliopita na huu mpya wa mwaka 2005?
- Tafadhali, unaweza kunijulisha juu ya semina au mafunzo yoyote uliyowahi kuhudhuria kuhusiana na utekelezaji wa mtaala mpya wa elimu ya sekondari wa mwaka 2005?
 - Umehudhuria mara ngapi mafunzo/semina za aina hii tangu uteuliwe kuwa kiongozi wa shule?
 - Ni mambo gani hasa unadhan yalizungumziwa kwenye semina hizo, hasa yale yanayohusiana na kuutekeleza mtaala mpya wa mwaka 2005?
 - Ni kwa namna gani unadhani mafunzo/semina hizo yamekusaidia kuboresha ujuzi wako wa kusimamia utekelezaji wa mtaala huu?

Sehemu ya 6: Hitimisho

Kuhusiana na haya yote tuliyoyazungumza leo hapa:

- ❖ Kuna jambo lolote ambalo halijagusiwa ambalo ungependa kutiongelea?
- ❖ Kuna swali lolote ambalo ungependa nilijibu?

Mshiriki wa tafiti (mtoa taarifa) anashukuriwa kwa kushiriki kakika mahojiano. Pia anataarifiwa kuwa ataletewa nakala ya kile kilichozungumzwa na tafsiri yoyote itakayofanywa na mtafiti ili afanye uhakiki wa mwisho.

APPENDIX 3

Backwardly Mapping Innovation Configuration interview schedule (Designed for interviewing teachers)

Date: ____/____/2017 Time: _____ to _____

Part A: Introduction

To put interviewees at ease, the researcher will start by introducing himself. Then, he will:

- ❖ Explain again the purpose of the study;
- ❖ Remind participants about how research ethics will be considered;
- ❖ Request permission from the participant to record the interview; and,
- ❖ Inform the participants that they are freed to use Kiswahili or English or both of them during the interview.

Part B: Background and warm-up questions

- ❖ Dear participant, would you mind telling me a little about yourself as a science teacher?
 - Among Science subjects, which ones have you been teaching in the last three years?
 - Which grades are you specifically engaged in teaching this subject?
 - How long have you been teaching this/these subject/s?
 - Do you like teaching this/these subject(s)? What really makes you feel this way?

Part C: The main interview

In your opinion, what are the instructional strategies that you often used to deliver your lesson?

- ❖ To what extent do you think the previous students' learning experiences informed your teaching processes?
 - Do you think you attempted to pre-test students' preconceptions and ideas before beginning a new lesson?
IF YES: What actions and events do you organise to do it?
 - Could you let me know the strategies you used to encourage students to use their preconceptions to construct new knowledge?
- ❖ Do you mind describing a little about the nature of lesson-related dialogue between you and students?
 - Which strategies did you use to foster exchange of ideas with students in the class?

- How often did you use these strategies: once, twice, monthly, weekly, or daily?
- Who do you think dominated the dialogue in the classroom between you and students?
- ❖ Do you think that you encouraged student-students to share ideas and/or to work cooperatively?
 - What sort of strategies did you use to achieve this goal?
- ❖ Do you think that you helped students to develop a relevant connection between what they learn in the class and their daily lives/contexts?
 - Do you mind telling me all strategies that you have used thus far to guide students to realise a connection between the skills (knowledge) that you teach and their contexts?
 - How many times per term have you organised such events per term: once, twice, monthly, weekly, or daily?
 - What sort of characteristics do you think you considered in designing such activities?
- ❖ Do you think that your teaching processes helped, in any way, to strengthen students' competence in using and developing knowledge?
 - Would you mind sharing with me the ways in which you fostered the development of such competence(s) among students?
- ❖ Do you think that you effectively gauged students' attainment of your lesson objectives?
 - What sort of strategies do you think you often employed to gauge students' understanding/mastery of the lesson?
- ❖ What enablers or impellers have you been experiencing in relation to implementing a competence-based curriculum?

Part D: Closing the interview

An informant is given the opportunity to ask question(s) and to add or clarify what he said during the interview. The researcher will ask: In relation to what we have covered here today with regard to teaching processes:

- Are there any other issues you would like to raise?
- Are there any questions you would like to ask?
- Of the discussed issues, is there anything that you would like to clarify more?
- Would you mind if I come back to you again for further discussion concerning these same issues?

Thanksgiving: The participant is thanked for her/his participation in the interview and s/he is reminded that s/he will receive a copy of the interview transcript for her/his approval as soon as possible.

KIAMBATISHO CHA 3

Muundo wa mahojiano yatakayolenga kubaini namna mwalimu anavyozingatia matakwa ya “constructivism” katika kufundisha mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania

Tarehe: _____ **Muda: Kuanza** _____ **kumaliza** _____

Sehemu ya A: Utangulizi

Katika hatua hii, mtafiti atajitambulisha na kuelezea madhumuni ya mahojiano. Nafasi hii pia itatumiwa kumweleza mshiriki wa tafiti, ambaye ndo mtoa taarifa mahususi, juu ya mwendendo wa mahojiano utakavokuwa. Mtafiti pia ataelezea namna ambavyo maadili ya kitafiti yatakavyozingatwa wakati na baada ya mahojiano kukamilika. Zaidi ya hayo, mshiriki wa tafiti atafahamishwa juu ya uhuru na uwezekano wa kutumia yoyote kati ya lugha ya Kiswahili na Kiingereza wakati wa mahojiano. Mwisho kabisa, mshiriki ataombwa ruhusa ya kurekodi mazungumzo yote kupitia kinasa sauti na karatasi. Madhumuni ya kurekodi mazungumzo na namna rekodi zitakavyotunzwa yataelezwa, ili kumwondolea hofu mtoa taarifa juu ya siri ya rekodi hizo.

Sehemu ya B: Maswali ya jumla yanayolenga kumweka mtoa taarifa katika hali ya utayari

- ❖ Ndugu mshiriki, unaweza kunieleza machache kuhusu wewe mwenyewe kama mwalimu?
 - Kati ya masomo ya Sayansi, ni lipi (yapi) ambayo umekuwa unayafundisha?
 - Haya masomo unafundisha wanafunzi wa madarasa/vidato gani?
 - Umekuwa unayafundisha haya masomo kwa muda gani sana?
 - Unadhan unapenda kuyafundisha haya masomo? Na ni nini hasa kinakufanya uwe na mtazamo huo?

Sehemu C: Mahojiano halisi kuhusu mada inayolengwa

- ❖ Unaweza kunieleza mambo mbalimbali ambayo unayafanya katika hatua za mwanzo kabisa za kuongoza somo darasani?
- ❖ Unadhani uelewa na ujuzi uliotokana na mazingira ya makuzi ya wanafunzi juu ya mada fulani unakusaidia katika kuwasilisha somo lako?
 - Unadhani unafanya uchunguzi wa kubaini uelewa wa kila mwanafunzi kuhusu mada inayotarajiwa kufundishwa?

Kama **NDIYO**: Ni mbinu gani hasa unatumia kufikia lengo hilo?

- Unaweza kunieleza namna ambavyo umekuwa ukiwasaidia wanafunzi kutumia uelewa na uzoefu wao wa awali katika kulielewa somo unalofundisha?
- ❖ Unaweza kunielezea juu ya uhalisia wa mawasiliano (mazungumzo) yanavyofanyika wakati wa somo?
 - Unatumia mbinu zipi kuhakikisha wanafunzi wanashiriki ipasavyo katika kutoa na kubadilishana mawazo/maoni juu ya mada wakati wa somo?
 - Unadhani ni mara ngapi katika muhula huwa unazitumia mbinu hizi: mara moja, mbili, mara moja kwa mwezi, mara moja kwa wiki, au kila siku?
 - Unadhan nnani, kati ya wewe mwalimu na wanafunzi, huwa anatawala mazungumzo kwa kiasi kikubwa darasani?
- ❖ Unadhan unatabia ya kuhamasisha tabia ya mashirikiano kati ya wanafunzi kuhusu kujifunza mambo mbalimbali yahasuyo Sayansi?
 - Unaweza kuelezea mbinu mbalimbali ambazo huwa unatumia kufanikisha lengo hili?
- ❖ Unadhani wanafunzi wako wamefaulu kuuhusianisha mada mbalimbali unazofundisha na mazingira au maisha yao ya kila siku?
 - Unaweza kuniambia mbinu mbalimbali ambazo umekuwa unazitumia kuhakikisha wanafunzi wako wanabaini uhusiano wa mada mbalimbali za kisayansi na mazingira yanayowazunguka?
 - Ni mambo gani (sifa zipi) unazitumia katika kuandaa muktadha wenye lengo hilo?
- ❖ Unadhan umekuwa na tabia ya kuwasaidia wanafunzi kukuza ujuzi, umahiri na stadi mbalimbali?
 - Mbinu gani unazitumia kukuza stadi na ujuzi wa wanafunzi?
- ❖ Unadhani una kawaida ya kutathmini malengo ya somo kwa kutumia mbinu zinazopendekezwa na Mtaala mpya wa Sayansi wa mwaka 2005 wa Tanzania?
 - Ni mbinu gani unazitumia katika kufanya tathmini hizo?
- ❖ Kiujumla, nini fursa na changamoto zilizopo kuhusiana na ufundishaji wa masomo ya Sayansi hapa shuleni?

Sehemu D: Hitimisho

- ❖ Kuhusiana na haya yote tuliyoyazungumza leo hapa:
 - Kuna jambo lolote ambalo halijagusiwa ambalo ungependa kutiongelea?
 - Kuna swali lolote ambalo ungependa nilijibu?
- ❖ Mshiriki wa tafiti (mtoa taarifa) anashukuriwa kwa kushiriki kakika mahojiano. Pia anataarifiwa kuwa ataletewa nakala ya kile kilichozungumzwa na tafsiri yoyote itakayofanywa na mtafiti ili afanye uhakiki wa mwisho.

APPENDIX 4

The Innovation Component Checklist

Components cluster	Component-related practices recommended by the 2005 Tanzanian curriculum	Tick (✓) all that apply
Organising and presenting lessons on the basis of student's preconceptions	- Identifies student's misconceptions using techniques such as oral questions, graphic organisers (KWL, KTN charts), or by asking students to sketch particular phenomena, etc. - Provides forums (e.g., developing flow charts, mapping of concepts) for students to tackle their misconceptions by themselves.	
Cherishing a culture of knowledge sharing/exchange	- Not only talks and demonstrates, but also allocates sufficient time for observing what/how students do and listens to what they say in relation to the lesson. - Allows students to ask one another, to challenge one another, and to discuss their responses amongst themselves. - Organises knowledge-exchange forums such as debates, seminars, etc.	
Cultivating a culture of collaborative and cooperative learning	- Uses cooperative grouping techniques involving such things as Jigsaw, Think-Pair-Share, and Talk-Partner while delivering a lesson. - When providing real-life experiences, most of the activities and assignments are offered in groups.	
Setting a scene that portrays how a lesson is both relevant and applicable to students' own contexts	- Derives and structures activities around student's surrounding/local environments. - Organises outdoors learning sessions, study tours and site-specific visits.	
Cultivating science-related attitudes and related competences	- Organises and assigns students a variety of hands-on activities such as projects, experiments, and practical works. - Allows students to manipulate concrete scientific apparatus/tools/models/materials.	
Evaluating lessons using performance-based evidences	Sets authentic-based assessment activities such as - Completion of real-world (field) tasks, - Simulation or role play, - Doing the scientific experiments, and - Portfolios.	

APPENDIX 5

Guiding questions for the analysis of instructional documents

- Which resources did the teacher plan to use?
 - To what extent can they make learning learner-centred?
 - How appropriate are they with the children background?
- Which specific methods have been mentioned in the lesson plans?
 - To what extent do they meet the demands of the constructivist practices?
- What type of activities are planned to be used to consolidate the lessons?
 - Are these activities independent or group-based?
 - Are these activities involve lab work and field work or merely paper-based?
 - To what extent do they reflect demands of constructivist teaching practices in terms of: time length, making learning personalised, and fostering creativity?

Questions on assignment records:

- What is/was the nature/form of assignment?
 - Mainly paperwork
 - Mainly oral
 - Lab/field work
- To what extent do the assignments reflect the curriculum objectives?
 - Which skills do they aim to develop?
 - Do these assignments feature the constructivist elements of the 2005 curriculum?
- How often are the assignments of this nature being given?

APPENDIX 6

Guide for analysing documents created by SBLs

The researcher will use the following list of questions for analysing various documents in the SBLs's offices.

General information about the document:

- Author of the accessed document(s)
- Whether or not someone else have influenced the creation of this document (E.g., whether or not there was an influence of any order or demand from top authorities).

About the document's purpose:

- Which information does the document exactly contain in relation to change facilitation activities?
 - Training (When, how, who)
E.g., inviting for a workshop/seminar, reviewing or clarifying something in relation to curriculum, provided new teaching-related directives
 - Reinforcing the use of curriculum (When, how, who)
E.g., promoting and encouraging proper implementation of the 2005 Science Curriculum
 - Monitoring (When, how, who)
E.g., demanding information about the use of the curriculum
- What type of action or reaction does the author demands from the science teacher?

Additional issues

- Number of times such documents have been produced
- Types of follow up indicated

APPENDIX 7

Stage of Concern Questionnaire

Respondent's pseudonym

The purpose of this questionnaire is to determine what people who are using or thinking about using the *2005 Tanzanian Inquiry and Student-Centred Curriculum* are concerned about at various times during the adoption process.

The items were developed from typical responses of school and college teachers who ranged from no knowledge at all about various programs to many years' experience using them. Therefore, many of the items on this questionnaire may appear to be of little relevance or irrelevant to you at this time. For the completely irrelevant items, please circle "0" on the scale. Other items will represent those concerns you do have, in varying degrees of intensity, and should be marked higher on the scale.

For example

This statement is true of me this time.	0	1	2	3	4	5	6	7
This statement is somewhat true of me now.	0	1	2	3	4	5	6	7
This statement seems irrelevant to me.	0	1	2	3	4	5	6	7

Please, respond to the items in terms of your present concerns, or how you feel about your involvement with the *2005 Tanzanian Inquiry and Student-Centred Curriculum*. We do not hold to any one definition of this curriculum so please think of it in-terms of your own perception of what it involves. Phrases such as "this approach" and "the new system" all refer to the same 2005 Tanzanian Secondary School Curriculum. Remember to respond to each item in terms of your present concerns about your involvement or potential involvement with the innovation.

Thank you for taking time to complete this task.

0	1	2	3	4	5	6	7	
Irrelevant	Not true of me now		Somewhat true of me now			Very true of me now		
Please Circle only one number for each item								
1. I am concerned about students' attitude towards the constructivist (student-centred) teaching practices emphasised in the 2005 Tanzanian secondary school curriculum.	0	1	2	3	4	5	6	7
2. Apart from the constructivist practices, I now know of some other approaches that might work better when implementing the 2005 Tanzanian secondary school curriculum.	0	1	2	3	4	5	6	7
3. I am more concerned about other new educational changes in Tanzania rather than the constructivist (student-centred) practices recommended in the 2005 Tanzanian secondary school curriculum.	0	1	2	3	4	5	6	7
4. I am concerned about not having enough time to organise myself each day.	0	1	2	3	4	5	6	7
5. I would like to help my staff colleagues in their implementation of the 2005 Tanzanian secondary school curriculum.	0	1	2	3	4	5	6	7
6. I have a very limited knowledge of the student-centred and constructivist teaching practices that are emphasised in the 2005 Tanzanian secondary school curriculum.	0	1	2	3	4	5	6	7
7. I would like to know what the effects of successful implementation of the 2005 Tanzanian secondary school curriculum on my professional status will be.	0	1	2	3	4	5	6	7
8. I am concerned about conflict between my own interests and my responsibilities.	0	1	2	3	4	5	6	7
9. I am concerned about revising the ways I am implementing the 2005 Tanzanian secondary school curriculum.	0	1	2	3	4	5	6	7
10. I would like to develop working relationships with other teachers in my science department and even those who are outside our department concerning the constructivist and student-centred techniques required to implement the 2005 Tanzanian secondary school curriculum.	0	1	2	3	4	5	6	7

11. I am concerned about how the constructivist and student-centred teaching practices that are recommended by the 2005 Tanzanian secondary school curriculum are affecting the students.	0	1	2	3	4	5	6	7
12. At this time, I am not concerned at all about applying the constructivist and student-centred teaching approaches when I teach.	0	1	2	3	4	5	6	7
13. I would like to know who will make decisions about the application of the constructivist and student-centred approaches in teaching.	0	1	2	3	4	5	6	7
14. I would like to discuss with others concerning the possibility of using the constructivist and student-centred practices that are recommended by the 2005 Tanzanian secondary school curriculum in my classes.	0	1	2	3	4	5	6	7
15. I would like to know what kind of help, support and resources are available and where I can get them in case I decide to teach according to the constructivist/student-centred practices recommended in the 2005 Tanzanian Secondary school curriculum.	0	1	2	3	4	5	6	7
16. I am concerned about my inability to manage the constructivist and student-centred teaching styles that are recommended in the 2005 Tanzanian Secondary school curriculum.	0	1	2	3	4	5	6	7
17. I would like to know how my teaching practices are supposed to change so that they can align with the constructivist and student-centred teaching demands of the 2005 Tanzanian Secondary school curriculum.	0	1	2	3	4	5	6	7
18. I would like to familiarise other fellow teachers with the progress of the way I use the constructivist and student-centred approaches in teaching.	0	1	2	3	4	5	6	7
19. I am concerned about evaluating my impact on students.	0	1	2	3	4	5	6	7
20. I would like to revise the student-centred teaching approaches recommended in the 2005 Tanzanian Secondary school curriculum.	0	1	2	3	4	5	6	7
21. I am preoccupied with many things other than the constructivist and student-centred ways of implementing the 2005 Tanzanian curriculum.	0	1	2	3	4	5	6	7

22. I would like to modify the way I implement our new 2005 curriculum based on the experiences of my students in the classroom.	0	1	2	3	4	5	6	7
23. I spend little time thinking about the student-centred teaching approaches that are emphasised in the 2005 Tanzanian Secondary school curriculum.	0	1	2	3	4	5	6	7
24. I would like to excite my students about their part in the constructivist and student-centred teaching practices that are emphasises in the 2005 Tanzanian Secondary school curriculum.	0	1	2	3	4	5	6	7
25. I am concerned about time spent working with non-academic problems related to the 2005 Tanzania Secondary school curriculum.	0	1	2	3	4	5	6	7
26. I would like to know what the implementation of the 2005 Tanzanian secondary school curriculum will require in the immediate future.	0	1	2	3	4	5	6	7
27. I would like to coordinate my efforts with those of my staff colleagues so that I can maximise the impacts of the 2005 Tanzanian Secondary school curriculum, especially regarding improvement of students' competences.	0	1	2	3	4	5	6	7
28. I would like to have more information concerning time and energy commitments required to successfully implement the changes introduced in the 2005 Tanzanian Secondary school curriculum.	0	1	2	3	4	5	6	7
29. I would like to know what other departments and other schools are doing in regard to the implementation of the constructivist ideals introduced in the 2005 Tanzanian Secondary school curriculum.	0	1	2	3	4	5	6	7
30. Priorities concerning other issues are currently preventing me from focusing my attention on both planning and teaching according to the constructivist and student-centred approaches emphasised in the 2005 Tanzanian Secondary school curriculum.	0	1	2	3	4	5	6	7
31. I would like to determine how to supplement, enhance, or replace the constructivist and student-centred teaching practices when implementing the 2005 Tanzanian Secondary school curriculum	0	1	2	3	4	5	6	7

32. I would like to use feedback from students to change the teaching approaches when implementing the 2005 Tanzanian Secondary school curriculum.	0	1	2	3	4	5	6	7
33. I would like to know how my role will change when I am teaching using the constructivist and student-centred practices that are recommended in the 2005 Tanzanian secondary school curriculum.	0	1	2	3	4	5	6	7
34. Coordination of tasks and colleagues is taking too much of my time.	0	1	2	3	4	5	6	7
35. I would like to know in what ways the constructivist ideals (student-centred practices) recommended in the 2005 Secondary school curriculum are better than the behaviourist approaches that we used to implement the previous (content-based) curriculum.	0	1	2	3	4	5	6	7

KIAMBATISHO CHA 7

Dodoso linalopima tabia na mitazamo inayojitokeza katika hatua mbalimbali za kutekeleza mabadiliko (ya mtaala)

Utambulisho wa mhojiwa

Kusudi la dodoso hili ni kubaini mitazamo mbalimbali ambayo watu wanaotumia au kufikilia kuamua kuutumia mtaala wa mwaka 2005 wa shule za sekondari Tanzania wanayo katika nyakati tofauti za utumiaji wa mtaala huu.

Maswali ya dodoso hili yaliandaliwa kutokana na maoni ya walimu wa shule na wa vyyuo. Baadhi ya waalimu hao hawakuwa na uelewa na uzoefu wowote juu ya programu mbalimbali kwa kipindi chote cha matumizi ya mtaala uliofanyiwa tafiti, lakini wengine walikuwa na uzoefu na uelewa wa mtaala huo. Ndiyo kusema kwamba, maswali mengi katika dodoso hili yanaweza kuwa na uhalisia kidogo au yasiwe ya uhalisia kabisa kwako kuzingatia kipindi ambacho wewe unajaza dodoso hili tangu uanze kuutumia mtaala huu wa mwaka 2005 wa elimu ya sekondari Tanzania. Sentensi unazodhani hazina uhalisia kwako, tafadhari zungushia “0”, na zile unazodhani zinawakilisha mtazamo wako unaombwa uziipe kiwango halisi cha uhalisia huo kwa kutumia namba 1 hadi 7 zilizopo kulia kwa kila sensensi. Maana ya namba hizi (0 hadi 7) zinaelezwa kwenye dodoso husika.

Kwa mfano:

Tungo hii ni ya ukweli kwa sasa.	0	1	2	3	4	5	6	7
Tungo hii ina ukweli kiasi fulani.	0	1	2	3	4	5	6	7
Tungo hii inaonekana haina uhalisia.	0	1	2	3	4	5	6	7

Tafadhari jibu kulingana na mtazamo wako kuhusiana na mtaala huu wa mwaka 2005 wa elimu ya secondary ya Tanzania. Hakuna tafsiri moja juu ya mtaala huu. Jambo muhimu ni mtazamo wako katika utekelezaji wa mtaala huu. Kauli kama “mbinu hii” na “mfumo mpya” vyote ni sawa kwa mtaala huu wa mwaka 2005 wa shule za sekondari Tanzania. Kumbuka kujibu kila kipengele kulingana na jinsi unavyohusika au ulivyohusishwa katika uandaaji na/au utumiaji wake. Asante kwa kutukia muda wako kukamilisha kazi hii.

0	1	2	3	4	5	6	7	
Kauli hii haihusiki	Kauli hii haiwakilishi mtazamo wangu wa sasa		Kauli hii inawakilisha kiasi fulani cha mtazamo wangu wa sasa			Kauli hii inawakilisha mtazamo wangu ipasavyo kwa wakati huu		
Tafadhari zungushia namba moja tu kwa kila kipengele								
1. Bado natafakari mitazamo ya wanafunzi kuhusu mbinu shirikishi ya ufundishaji zilizoainishwa kwenye mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7
2. Ukiachilia mbali matumizi ya mbinu shirikishi za ufundishaji, kwa sasa nafahamu pia mbinu nyingine zinazoweza kuleta ufanisi zaidi katika utekelezaji wa mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7
3. Ninajishughulisha zaidi kuhusu mabadiriko mengine katika sekta ya elimu Tanzania kulinganisha na suala la utumiaji wa mbinu shirikishi za ufundishaji zilizopendekezwa katika mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7
4. Mashaka yangu hasa ni kukosa muda wa kutosha wa mimi mwenyewe kujiandaa kila siku.	0	1	2	3	4	5	6	7
5. Ninatamani kuwasaidia wafanyakazi wenzangu ili nao wafaulu kufundisha kadiri inavyopendekezwa na mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7
6. Nina uelewa mdogo sana kuhusinana na matumizi ya mbinu shirikishi zinazosisitizwa na mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7
7. Ningependa kufahamu ni kwa namna gani makufanikio ya utekelezaji wa mtaala huu wa mwaka 2005 wa elimu ya sekondari Tanzania yataboresha hadhi na nafasi yangu kama mwalimu.	0	1	2	3	4	5	6	7
8. Ninatatizwa na mgogoro kati ya mambo yangu binafsi na majukumu yangu ya kikazi.	0	1	2	3	4	5	6	7

9. Natafakri namna ninavyoweza kuboresha utekelezaji wangu wa mtala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7
10. Ningependa kuboresha mahusiano yangu kikazi na walimu wengine ndani nan nje ya idara ya sayansi kwa lengo ya kuyafanya yasaidie kushawishiana na kuboresha matumizi ya mbinu shirikishi wakati wa ufundishaji inayopendekezwa na mtaala wa mwaka 2005 wa elimu ya sekondari ya Tanzania.	0	1	2	3	4	5	6	7
11. Natafakri namna ambavyo matumizi ya mbinu shirikishi inayopendekezwa na mtaala wa huu wa mwaka 2005 wa elimu ya sekondari Tanzania unavyoathiri au kufaidisha wanafunzi katika kujifunza.	0	1	2	3	4	5	6	7
12. Kwa sasa sina hofu kabisa kuitumia mbinu shirikishi ninapofundisha.	0	1	2	3	4	5	6	7
13. Ningependa kufahamu nani atafanya maamuzi juu ya matumizi ya mbinu shirikishi katika ufundishaji.	0	1	2	3	4	5	6	7
14. Ningependa kujadiri na waalimu wengine kuhusu uwezekano wa kutumia mbinu shirikishi zilizopendekezwa na mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7
15. Endapo nitaamua kufundisha kwa kutumia mbinu shirikishi zilizopendekezwa kwenye mtaala wa 2005 wa elimu ya sekondari Tanzania, basi ningependa kufahamu msaada na rasilimali zinazohitajika na wapi ninapoweza kuvipata.	0	1	2	3	4	5	6	7
16. Natafakari juu ya uwezo wangu mdogo kumudu kufundisha kwa kutumia njia shirikishi zinazopendekezwa na mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7
17. Ningependa kufahamu ni jinsi gani ninatakiwa kubadilisha ufundishaji wangu ili kuendana na matakwa ya mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7

18. Ningependa kuwashirikisha walimu wenzangu kuhusu ninavyoendelea kujaribu kutumia njia shirikishi katika ufundishaji.	0	1	2	3	4	5	6	7
19. Kufanya tathimini ya matokeo au athari za ufundishaji wangu kwa wanafunzi ni suala ninalolifikiria.	0	1	2	3	4	5	6	7
20. Ningependa kuboresha zaidi njia shirikishi za ufundishaji zilizopendekezwa na mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7
21. Nimesongwa na kuwazia utekelezaji wa majukumu mengine tofauti kabisa na suala la kutumia mbinu shirikishi wakati nafundisha kama iliyopendekezwa na mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7
22. Ningependa kuboresha utekelezaji wangu wa mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania uendane na uwezo wa wanafunzi wangu darasani.	0	1	2	3	4	5	6	7
23. Natumia muda kidogo sana kutafakari juu ya mbinu mpya za ufundishaji zinazosisitizwa katika mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7
24. Ningependa kuwahamasisha na kuwasisimua wanafunzi wangu juu ya nafasi na wajibu wao katika kujifunza wakati ninapotumia mbinu shirikishi zinazopendekezwa na mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7
25. Ninatafakari ambavyo muda mwingi tunavyotumia kufanya mambo ambayo kimsingi si ya kitaaluma licha ya kuwa yanahusishwa na utekelezaji wa mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7
26. Ningependa kufahamu ni mambo gani yanatakiwa ili kuweza kufundisha kwa kutumia mbinu shirikishi zilizopendekezwa na mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania katika siku chache zijazo.	0	1	2	3	4	5	6	7
27. Ningependa kuunganisha jitihada zangu na za waalimu wenzangu ili kuongeza ufanisi wa utekelezaji wa mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7

28. Ningependa kupata taarifa zaidi kuhusiana na muda na nguvu zinazohitajika kufanikisha ufundishaji wa kutumia mbinu shirikishi kama ilivyopendekezwa na mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7
29. Ningependa kufahamu idara na shule nyingine wanafanya nini kuhusiana na matumizi ya njia shirikishi za ufundishaji zinazohimizwa na mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7
30. Kuna mambo mengine nimeyapa kipaumbele kwa sasa, na hivyo yanapunguza umakini wangu katika kufanya maandalizi na kufundisha kwa kutumia mbinu shirikishi zilizosisitizwa na mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7
31. Ningependa kuzifahamu mbinu mbadala au namna ya kuboresha mbinu hizi zilizopendekezwa na mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7
32. Ninafikiria kutumia mrejesho wa wanafunzi kuboresha au kubadili mbinu za ufundishaji zilizopendekezwa na mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7
33. Ningependa kufahamu namna ambavyo majukumu yangu kama mwalimu yatabadilika kutokana na kutumia mbinu shirikishi iliyopendekezwa na mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania.	0	1	2	3	4	5	6	7
34. Majukumu mengine na kuratibu wafanyakazi wenzangu vinananichukulia muda mwingi.	0	1	2	3	4	5	6	7
35. Ningependa kufahamu ni kwa namna gani mbinu shirikishi zilizopendekezwa kwenye mtaala wa mwaka 2005 wa elimu ya sekondari Tanzania zitaleta ufanisi zaidi kulinganisha njia zisizo shirikishi zilizotumika kutekeleza mtaala uliopita.	0	1	2	3	4	5	6	7

APPENDIX 8

The research permission from the Tanzanian Government

THE UNITED REPUBLIC OF TANZANIA

PRESIDENT'S OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT

Telegraphic Address: "REGCOM"
Phones: 023 2604237/2604227

Fax No: 260 09 73
In Reply please quote:



Regional Commissioner's Office,
P.O. Box 650,
MOROGORO.

Ref. No: AB. 175/245/01/16

31st August, 2017

District Administrative Secretary,
Morogoro.

Re: RESEARCH PERMIT

Please refer to the above mentioned subject.

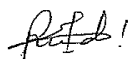
I am writing to introduce to you **Mr. Noel Mark Makwinya** who is a lecture working in the Department of Education, under the Solomon Mhlangu College of Science and Education of Sokoine University of Agriculture.

Currently **Mr. Noel Mark Makwinya** is a PhD student at Edith Cowan University (ECU) - Australia and he is required to undertake a Research on the topic titled: "*Managing Change of Lower Secondary Science Curriculum in Tanzania: Revealing of Transition in Three Case School*" and he expects to accomplish this requirement in Morogoro Municipality by involving two categories of participant within each of the attended schools (i) school leaders, specifically the school principal, the school Academic Master/Mistress and the head of Science Department and (ii) Science Teachers, particularly those teaching Biology and Chemistry.

The period by which this permission has been granted is from 31st August, 2017 to 15th May 2019.

Please provide him with all necessary assistance to enable the accomplishment of his research in your District.

Thank you for your cooperation.



Daniel E. Muzanye
For: Regional Administrative Secretary.

APPENDIX 9

Research Information and an invitation for school to participate

The research topic

Managing Science Teachers' Adoption of the 2005 Tanzanian Science Curriculum: School-Based Leaders' Practices and Achievements



Dear **Head of School**, I am writing to request your permission to conduct a research at your school. This research is carried out as part of the Ph.D. requirements at Edith Cowan University.

Objectives and expected outcomes

As we all know, the Tanzanian secondary education curriculum was changed from teacher-centred to inquiry and student-centred design in 2005. Since this change, no investigation has been conducted to find out how teachers' implementation of this new curriculum is guided by the School-Based Leaders in schools. This study intends to fill this gap.

Findings from this study will inform educational stakeholders in Tanzania, and in particular school-based leaders, about the curriculum-change guidance that they provided to teachers. This information is expected to help you in the future to reflect upon your change-adoption guidance practice and perhaps improve it to achieve a rapid transition of the implementation practice to embrace the requirements of the 2005 Tanzanian Science Curriculum.

Intended data collection strategies

Kindly be advised that the intended information will be collected using four different strategies. These include:

- Face-to-face interview with the participants;
- Filling of questionnaires;
- Document reviews; and,
- Non-participant observation.

None of these processes will involve videoing. Nevertheless, the interviews might be audio-recorded if the interviewees will agree.

Intended participants

In order to achieve its objectives, this project targets to involve two categories of participants:

- School-based leaders. This category will consist of yourself (the School Principal), the School Academic Master/Mistress, and the Head of the Science Department; and,
- The Science Teachers. This group will consist of teachers who have been attempting to implement the 2005 Science Curriculum in not less than the last three consecutive years.

If allowed to involve your school in this study, I will request you to participate in the process of identifying potential participant science teachers. Once the names of potential participant-teachers are identified, the researcher will then contact each of them in person. During the personal conversation, each participant will be provided with both an invitation letter and a consent form in which s/he will be asked to sign to indicate whether or not s/he agrees to participate in the study.

Research ethics

Please be informed that the data collection process is expected to be completed within five months. Throughout this period, the principles of confidentiality and voluntary participation will be observed.

- Neither explanation nor justification will be demanded if you decide to withdraw your school from the study. Similarly, neither explanation nor justification will be needed if any participant will decide to withdraw her/himself or some of the information s/he has provided from the study.
- All of the collected data will be stored securely within ECU's premises for up to five (5) years, after which they will be destroyed. While secured the data will only be accessible to members of the research team.

You are advised that the researcher's interest will be in the meanings of the things and issues he will see during the investigation, hear from you, and read in any document he will access concerning your school. Therefore, you are guaranteed that the data will be collected and used without identifying participants and their contexts. Extra care will be taken to ensure that neither names of participants nor of the school in which they work is revealed in any of the research products.

Questions and/or further information

If your school will have any question or require any further information about the research project, please contact the researcher or any of his two supervisors. Their contacts are:

The researcher

Noel Mark Makwinya
Edith Cowan University
School of Education
270 Joondalup Drive
JOONDALUP WA 6027
Mobile Ph: +[REDACTED]
[REDACTED]
[REDACTED]

Principal Supervisor

Assoc. Prof. Geoffrey W.
Lummis (PhD)
Edith Cowan University
School of Education
2 Bradford Street
Mount Lawley WA 6050
Mobile Ph: +61 410 032 563
g.lummis@ecu.edu.au

Associate Supervisor

Prof. David H. McKinnon
Edith Cowan University
School of Education
270 Joondalup Drive
JOONDALUP WA 6027
Mobile Ph: +61411315342
d.mckinnon@ecu.edu.au

If your school wish to present any of your concerns or complaints about this research project to an independent person, you may directly contact:

Research Ethics Officer
Edith Cowan University
270 Joondalup Drive
JOONDALUP WA 6027
Phone: (08) 6304 2170
Email: research.ethics@ecu.edu.au

Further information

Please note that:

- This project has been approved by the ECU Human Research Ethics Committee.
- This invitation letter is accompanied with a consent form. If you are prepared to allow your school to participate in this project, you will be required to sign and return the attached consent form to me.

Thank you

.....
Noel Mark Makwinya

Date..... /2017

KIAMBATISHO CHA 9

Maudhui ya Tafiti na mwaliko wa shule kushiriki

Mada ya tafiti

Mapokeo ya Mtaala wa Mwaka 2005 wa Elimu ya Secondari Tanzania Katika Kufundishia Masomo ya Sayansi: Nafasi ya Uongoziwa Shule na Mafanikio



Lengo la barua hii ni kurasmisha ombi langu nililolite kwako kwa njia yam domo kuhusu kusudio langu la kuihusisha shule yako kwenye tafiti ninayotarajia kuifanya. Tafiti hii ni sehemu ya masomo yangu ya Shahada ya Uzamivu ninayoyafanya katika Chuo kikuu cha Edith Cowan kilichopo nchini Australia.

Maudhui ya tafiti na faida zinazotarajiwa

Kama ujuavyo, Mitaala ya Tanzania imebadilishwa mwaka 2005 kutoka ule unaozingatia maarifai tu (content-based) kwenda ule unaozingatia ujuzi (uwezo) na maarifa kwa pamoja (competence-based). Licha ya mabadiliko hayo, bado hatuna taarifa za kutosha zinazoeleza ni kwa namna gani viongozi wa shule wamekuwa wakiwaongoza waalimu mashuleni kuumudu ufundishaji wa mtaala huu. Tafiti hii inakusudia kujaza pengo hili.

Njia za ukusanyaji wa taarifa

Taarifa husika zitakusanywa kwa kutumia njia kuu nne. Nazo ni:

- Kutumia dodoso;
- Mahojiano ya ana-kwa-ana,
- kwa kuangalia ufundishaji wa waalimu au namna wanavyoongozwa na viongozi; na,
- kwa kusoma taarifa zilizomo kwenye maandiko (hati) mbalimbali.

Unataarifiwa kwamba ukusanyaji wa taarifa hizi hautahusisha uchukuaji wa video za tukio lolote. Hata hivyo, kwa rufusa ya mshiriki, mtafiti atarekodi sauti za maongezi za mahojiano ili yamsaidie kuweka kumbukumbu sahihi. Zoezi hili linakadiriwa kuchukuwa kati ya miezi minne hadi sita.

Watoa taarifa wanaolengwa

Ili kufikia malengo, tafiti hi inalenga kuwahusisha makundi mawili ya wanataaluma ndani ya shule yako:

- Kundi la kwanza ni la viongozi wa taaluma. Kundi hili litahisisha Mkuu wa shule, kiongozi Mkuu wa Taaluma na wakuu wa Idara ya masomo ya Sayansi
- Kundi la pili ni la waalimu. Kundi hili litahisisha waalimu watatu wa masomo ya Sayansi tu.

Endapo utaniruhusu kushirikisha shule yako katika tafiti hii, walengwa hawa wataalikwa rasmi mmoja-mmoja. Wakati wanapewa mwaliko ana-kwa-ana, wahusika watapewa pia barua rasmi ya mwaliko pamoja na fomu ambayo atatakiwa kusaini kama atakuwa tayari kuridhia kushiriki.

Maadili ya kitafiti

Wakati wote wa tafiti, misingi ya kuheshimu faragha, siri na uhuru wa mhusika kushiriki au kutoshiriki vitazingatiwa. Mathalani:

- Shule, wewe mwenyewe au mhusika yeyote atakuwa huru kujitoa au kuamuru kuondolewa kwa taarifa ambazo ameshazitoa. Yote kati ya haya hayatakuwa na adhabu yeyote. Mtafiti anafaham kuwa maamuzi hayo pia ni sehemu ya utafiti.

- Tarifa zitazokusanywa zitahifadhiwa kwenye chumba chenye makabati maalumu kilichopo katika Chuo Kikuu cha Edith Cowan nchini Australia kwa kipindi kisichozidi miaka minne. Wakati zimehifadhiwa, taarifa zitakuwa zinaweza kufikiwa na mtafiti mwenyewe pamoja na wasimamizi wake, ambao tarifa zao zimeainishwa hapa chini. Baada ya kipindi hicho, data zitaharibiwa rasmi na uongozi wa Chuo Kikuu cha Edith Cowan.

Unataarifiwa kuwa ukusanyaji wa taarifa hautausisha majina au utambulisho wa shule na wahusika kwa namna yoyote ile. Lengo la mtafiti ni ujumbe wa atakachokisikia, kuona au kukisoma katika nyaraka mbambali atakazopewa shuleni.

Kufikisha malalamiko kwa ofisa binafsi

Kama una maswali au dukuduku, tafadhali wasilisha kwa mtafiti mwenyewe au wasimamizi wake. Anuani za wasimamizi hao ni:

Mtafiti

Noel Mark Makwinya
Edith Cowan University
School of Education
270 Joondalup Drive
JOONDALUP WA 6027
Mobile Ph: [REDACTED]
[REDACTED]
[REDACTED]

Msimamizi Na. 1

Assoc. Prof. Geoffrey W.
Lummis (PhD)
Edith Cowan University
School of Education
2 Bradford Street
Mount Lawley WA 6050
Mobile Ph: +61 410 032 563
g.lummis@ecu.edu.au

Msimamizi Na. 2

Prof. David H. McKinnon
Edith Cowan University
School of Education
270 Joondalup Drive
JOONDALUP WA 6027
Mobile Ph: +61411315342
Email:
d.mckinnon@ecu.edu.au

Kama kutakuwa na jambo ambalo unadhan ni lazima uwasiliane na kulifikisha kwa mtu ambaye hausiki na tafiti hii moja kwa moja, basi unashauriwa kuwasiliana naye kwa kutumia anuani ifuatayo:

Research Ethics Officer
Edith Cowan University
270 Joondalup Drive
JOONDALUP WA 6027
Na. ya simu: (08) 6304 2170
Barua pepe: research.ethics@ecu.edu.au

Hitimisho

Tafadhali zingatia kwamba:

- Tafiti hii imethibitishwa na Kamati inayoshughulia Maadili ya kitafiti ya ECU
- Endapo umejiandaa kuridhia ombi langu na kuruhusu shule yako kushiriki tafiti hii, nitaomba usaini fomu iliyoambatanishwa hapa chini.

Nakushukuru sana.

.....
Noel Mark Makwinya

Tarehe..... / 2017

APPENDIX 10

A consent form to be signed by the principal on behalf of the school

Research topic

Managing Science Teachers' Adoption of the 2005 Tanzanian Science Curriculum: School-Based Leaders' Practices and Achievements



Please read the following information, enter details as required and sign at the bottom if you agree to participate in this study.

I, the undersigned, have read the information included in the letter preceding this consent form and have been informed about all aspects of this research project. All the questions that I asked the researcher about this project were answered to my satisfaction.

Based on this, I understand that:

- The school, the School Principal, General Academic Master/Ministress, Head of the Science Department and selected Science teachers shall participate in this study only on voluntary grounds and that they will be personally free to withdraw at any time that they might wish to do so and without any consequences.
- The intended information will be collected using three strategies only. These are: (i) face-to-face interviews with each participant; (ii) the use of nonparticipant observation techniques; and (iii) by the use of document-reviews.
- Any of the collected information will be kept confidentially. All the data, including the password-protected interview-recordings, will be locked in a cabinet in a secure location at ECU for up to five (5) years, after which they will be officially destroyed by ECU. During this time, all of the collected information will only be accessible to members of the research team.
- Any data gathered for this study might be published. However, the researcher is responsible for using the information concerning this school and of the individual participants anonymously. No person's or school-related identity shall be disclosed in any final report.
- I can contact Professor David H. Mckinnon and Associate Professor Geoff Lummis, who are the researcher's supervisors, if I have any further queries, concerns, and complaints concerning the way this study will be conducted at my school. I am given their contact detail in the Information Letter. I am also provided with the contact details of an independent person to whom I can present any of my concerns or complaints about this research project in case I wish to do so.
- I can withdraw my school from the research at any time and without penalty.

In view of this understanding, I give my permission for _____ (name of school) to participate in this research project.

School Principal's Signature

.....

Date:

..... / 2017

KIAMBATISHO CHA 10

Fomu ya Kuridhia Shule Kushiriki Tafiti itasainiwa na mkuu wa shule

Mada ya Tafiti:

*Mapokeo ya Mtaala wa Mwaka 2005 wa Elimu ya Secondari Tanzania
Katika Kufundishia Masomo ya Sayansi: Nafasi ya Uongoziwa Shule na
Mafanikio*



Mimi, niliyesaini hapo chini, nimesoma taarifa iliyoambatanishwa na fomu hii kuhusiana na tafiti tajwa hapo juu, na nimepata wasaa wa kupewa taarifa kwa mdomo kuhusiana na tafiti inayolengwa. Kupitia nafasi mbalimbali, nimepata wasaa wa kuuliza maswali mbalimbali kuhusiana na tafiti hii na nimejibiwa kwa kiwango cha kuridhisha.

Ninafahamu na kuridhika kwamba:

- ushiriki wa yeyote kati ya washiriki walengwa (mimi mwenyewe, waalimu na viongozi) utatokana na maamuzi yake huru. Hatalazimishwa na mtu na atakuwa tayari kujitoa muda wowote atakaojisikia kufanya hivyo bila kuadhibiwa kwa namna yoyote.
- taarifa zinazokusudiwa zitakusanywa kwa njia tatu:
 - i. mahojiano ya ana kwa ana na kila mmoja wa washiriki,
 - ii. kutazama moja-kwa-moja namna mwalimu au kiongozi wa shule unafanya mambo mbalimbali yahasuyo yanayolengwa na tafiti hii, na
 - iii. kupitia kumbukumbu za hati na maandiko mbalimbali. Nafahamu kuwa ofisi yangu itahusika kwa namna moja au nyingine kwa kumruhusu mtafiti kuziona nyaraka na hati mbalimbali za kiofisi.
- mtafiti atahakikisha usiri wa taarifa zozote atakazokusanya. Taarifa zote zitafungiwa kwenye chumba malumu katika moja ya majengo ya Chuo kikuu cha Edith Cowan (ECU) kwa muda usiozidi miaka mitano (5). Baada ya hapo, taarifa hizi zitaharibiwa chini ya uangalizi maalumu wa chuo. Zikiwa zimehifadhiwa, taarifa hizo zitakuwa zinafikiwa na mtafiti au wasimamizi wake tu.
- taarifa zitakozokusanywa zinaweza kuchapishwa. Hata hivyo, mtafiti ana wajibu wa kuhakikisha kuwa jina la shule, mwalimu. Kiongozi na wala utambulisho wa yeyote kati ya haya hautakuwepo ndani ya machapisho.
- Kwamba endapo nitakuwa na dukuduku, mashaka na jambo la kuhtaji ufafanuzi wa ziada, naweza kuwasiliana moja-kwa-moja na wasimamizi wakuu wa mtafiti huyu, ambao ni Profesa David H. Mckinnon and Profesa Mshiriki Geoffrey Lummis. Mawasiliano ya wasimamizi hawa nimepatiwa kuitia barua ya mwaliko.
- Kwamba naweza kufikisha maalamiko yangu moja kwa moja chuoni ECU, kwa ofisa ambaye hausiki na tafiti hii moja kwa moja lakin anashughulikia malalamiko yatokanayo na ukiukwaji wa maadili ya tafiti mbalimbali.
- Na kwamba, endapo nitaona kuna haja, naweza kusitisha ushiriki wa shule yangu kwenye tafiti hii bila ya kuulizwa na yeyote na wala kupewa adhabu yeyote.

Kutokana na haya yote ninayoyafahamu kuhusu tafiti hii, natamka rasmi kuwa ninaruhusu shule yangu _____ (jina la shule) ishiriki katika tafiti hii.

Sahihi ya mkuu wa shule

.....

Tarehe:

..... / 2017

APPENDIX 11

Research information and invitation for the School Leader

Dear **School Principal/GAM/HoD**,

I am inviting you to participate in my research. This research is titled as, *Managing Science Teachers' Adoption of the 2005 Tanzanian Science Curriculum: School-Based Leaders' Practices and Achievements*. This study is part of the Ph.D. requirements at the Edith Cowan University (ECU).



Objectives and expected outcomes

This study intends to examine how you (school-based leaders) have guided science teachers to implement the 2005 Tanzanian Inquiry and Student-centred Science Curriculum and the extent to which your guidance helped them to implement it.

The researcher believes that your position as the school leader makes you a good source of information about change-adoption leadership. Therefore, you will be requested to provide information concerning the ways in which you have guided science teachers in your school to understand the requirements of this curriculum as well as implement it.

Findings to be obtained from this study are expected to inform stakeholders about how the implementation of the 2005 Tanzanian Inquiry and Student-Centred Curriculum is guided in secondary schools. It is expected that such information will also help you as a school-based leader to reflect upon the way your change leadership practices enhanced science teachers' pedagogical transition from the instructional practices that were relevant for the previous Tanzanian science curriculum to the ones demanded by the current 2005 Tanzanian Inquiry and Student-Centred Curriculum.

Methodology:

This study will rely on your personal views regarding the way you guided science teachers to implement this 2005 Tanzanian Inquiry and Student-centred Science Curriculum. Therefore, face-to-face interviews will be the primary way of collecting the intended information. These interviews sessions are expected to last for about one hour. Be advised that for the researcher to triangulate the results, he will collect additional information by reviewing your leadership documents and by observing various leadership events. Therefore, you are advised that this study intends to engage you in these three different but related ways. The data collection process is expected to be completed within four to six months. This information is important for you to decide whether, or not, you can participate in this study.

Quality control and Ethics:

Throughout the study, voluntary participation will be respected. Therefore, you will be free to quit the study at any time. You will also be free to withdraw any information that you might have already provided to the researcher. You will neither face penalty nor be asked why you have made any of such a decision. Any decision to withdraw will be respected as part of the investigation.

Kindly be informed that any information that you will provide concerning yourself or of the context of your work will be kept confidentially. All forms of data will be stored together with the password-protected audio-recordings in a locked cabinet in a secure location at ECU for a maximum of five (5) years. While secured, the data will only be accessible to members of the research team. After this period, they will be destroyed.

During data collection and analysis, the researcher's interest will be in the meanings of the things that:

- you will state regarding what and how you do as you guide teachers' implementation of this new curriculum;
- will be observed when you guide the teachers; and,
- that will be revealed in the documents related to this exercise.

Therefore, you are guaranteed that the data will be non-identifiable. Extra care will be taken to ensure that neither your name nor that of the school in which you are working is revealed in any of the research products.

Finally, you are informed that the researcher will provide you with opportunities to check his analysis and any of his conclusions before results are officially published. Among many other reasons, this is aimed to give you an opportunity to:

- cross-validate any interpretation that will be done, and
- to determine the degree to which issues of confidentiality and privacy of yourself and of the information you provided were honoured.

Questions and/or further information:

If you have any questions or require any further information about the research project, please contact the researcher himself or any of his two supervisors. Their contacts are:

The researcher

Noel Mark Makwinya
Edith Cowan University
School of Education
270 Joondalup Drive
JOONDALUP WA 6027
Mobile [REDACTED]
[REDACTED]
[REDACTED]

Principal Supervisor

Assoc. Prof. Geoffrey W.
Lummis (PhD)
Edith Cowan University
School of Education
2 Bradford Street
Mount Lawley WA 6050
Mobile Ph: +61 410 032 563
Email: g.lummis@ecu.edu.au

Associate Supervisor

Prof. David H. McKinnon
Edith Cowan University
School of Education
270 Joondalup Drive
JOONDALUP WA 6027
Mobile Ph: +61411315342
Email: d.mckinnon@ecu.edu.au

If you wish to present any of your concerns or complaints about this research project to an independent person, you may use the following contact:

Research Ethics Officer
Edith Cowan University
270 Joondalup Drive
JOONDALUP WA 6027
Phone: (08) 6304 2170
Email: research.ethics@ecu.edu.au

Further information

Please note that:

- This project is already approved by the ECU Human Research Ethics Committee.
- This invitation letter is accompanied with a consent form. If you are prepared to participate in this project, you will have to sign and return the attached consent form to me.

Thank you

.....

Noel Mark Makwinya

Date..... / **2017**

KIAMBATISHO CHA 11

Mwaliko wa kushiriki tafiti

Ndugu **Mkuu wa Shule,**

Naomba nikualike rasmi kushiriki kwenye tafiti ninayotarajia kuifanya.

Mada kuu ya tafiti hii ni, *Mapokeo ya Mtaala wa Mwaka 2005 wa Elimu ya Sekondari Tanzania Katika Kufundishia Masomo ya Sayansi: Nafasi ya Uongoziwa Shule na Mafanikio.*



Tafiti hii ni sehemu ya masomo yangu ya Shahada ya uzamivu ninayoyafanya katika Chuo kikuu cha Edith Cowan (ECU).

Malengo na faida tarajali:

Kama ujuavyo, Mtaala wa elimu Tanzania umebadilishwa mwaka 2005 kutoka ule unaozingatia maarifai tu kwenda ule unaozingatia ujuzi (uwezo) na maarifa kwa pamoja. Licha ya mabadiliko hayo, bado hatuna taarifa zinazoeleza ni kwa namna gani viongozi wa shule wamekuwa wakiwaongoza waalimu mashuleni kuumudu ufundishaji wa mtaala hu una mafanikio ya jitihada hizo kwa waalimu. Tafiti hii inakusudia kuziba mapungufu haya.

Endapo utakubali, ushiriki wako utalenga kunipatia taarifa zinazohusu namna ambayo wewe binafsi umekuwa ukiwaongozwa waalimu wa shule hii sio tu kuuelewa, bali pia kuufundisha mtaala wa mwaka 2005 kwa shule za sekondari Tanzania kadiri ya misingi yake. Ninaamini kuwa nafasi yako katika uongozi ina umuhimu wa kunipa taarifa ninazotafuta. Hivyo, wewe ni mtu muhimu sana kwenye tafiti hii.

Matokeo ya tafiti hii yana faida nyingi zinazotegewa. Moja ni kuwapa taarifa washika dau wote wa Elimu Tanzania kuhusiana na namna ambavyo mtaala wa mwaka 2005 wa elimu ya Sekondari Tanzania unasimamiwa na viongozi na kuzingatiwa na waalimu mashuleni. Ni matumaini yangu kuwa matokeo ya tafiti hii yatakusaidia wewe na viongozi wengine wa shule kubuni mbinu mbadala au kuziboresha mnazozitumia sasa katika kuwasaidia waalimu kuumudu mtaala mpya kwa haraka. Kwa kufanya hivi, itasaidia kuharakisha uboreshaji wa ufundishaji mashuleni na hivyo kufikia malengo yaliyokusudiwa kwa haraka.

Mbinu za kitafiti zinazotarajiwa kutumiwa:

Ili kufikia malengo, tafiti itajikita kukusanya maoni yako binafsi kuhusiana na mambo haya kupitia mahojiano ya moja kwa moja. Vile vile, taarifa za ziada zitakusanywa kwa njia nyingine mbili, nazo ni: (i) kukuangalia moja-kwa-moja namna ambavyo unawaongozwa waalimu kuuelewa na kuutekeleza mtaala mpya, na (ii) kwa kusoma taarifa zilizomo kwenye nyaraka (hati) mbalimbali ambazo umekuwa ukiziandika kwa lengo la kufikisha miongozo kwa waalimu kuhusiana na mtaala huu.

Miiko ya kitafiti:

Unafahamishwa kuwa taratibu zote za tafiti hii zitazingatia misingi ya ushiriki huru na usiri wa taarifa za mshiriki na za maeneo ya kazi yake. Taarifa zitazokusanywa zitatumika katika

hali ambayo haziwezi kukubainisha wewe au mazingira yako. Kutakuwa na umakini mkubwa kuhakikisha kuwa jina lako na la mzingira yako ya kazi havitahitajika au kutumika wakati wa tafiti hii.

Unahakikishiwa kuwa uamuzi wako wa kushiriki utakiwa wenye uhuru mkubwa. Wakati na siku yoyote, unaweza kuamua kujitoa kushiri tafiti hii au kuomba baadhi ya taarifa ulizozitoa ziondolewe au vyote viwili. Endapo utafanya maamuzi yoyote kati ya haya, hautaulizwa wala kuadhibiwa kwa na namna yoyote na mtu yeyote. Mtafiti anafahamu kuwa hiyo ni haki yako ya msingi nani sehemu ya matokeo muhimu ya tafiti.

Pia unataarifiwa kwamba taarifa unazozitoa kuhusu wewe mwenyewe na za mazingira yako ya kazi hazitatolewa kwa mtu yeyote. Tarifa zitazokusanywa zitahifadhiwa kwenye chumba chenye makabati maalumu ambayo yanafungwa kwa kufuli maalumu kilichopo katika Chuo Kikuu cha Edith Cowan nchini Australia kwa kipindi kisichozidi miaka mitano (5). Zikiwa zimehifadhiwa kwenye chumba hicho maalumu, taarifa zitafikiwa na mtafiti mwenyewe pamoja na wasimamizi wake tu. Baada ya hapo, mtafiti atawasiliana na uongozi wa chuo ili kuziharibu rasmi.

Wakati wa kukusanya na kuzichambua taarifa, mtafiti atalenga kubaini maana ya mambo na vitu ambavyo:

- Utavisema kuhusiana na namba ambayo viongozi wa shule wanakuongoza kuutekeleza mtaala mpya;
- Utaonekana kuvifanya wakati unatekeleza mtaala mpya;
- Utavibainisha kwenye dodoso; na
- Vitasomwa kwenye nyaraka na dokument mbalimbali za kiufundishaji ulizowahi kuziandaa

Kabla taarifa zilizokusanywa hazijachapishwa, utapewa nakala inayoonyesha zilivyotumika pamoja na namna mbayo taarifa zilitafsiriwa. Lengo la kufanya hivi ni:

- Kukupa nafasi ya kuzihakiki, kuzipima na kujiridhisha ni kwa kiwango gani masharti haya yameheshimika.
- Kukuwezesha kukagua uhalisia na ubora wa tafsiri iliyofanyika

Maswali na malamiko:

Kama una maswali au dukuduku, tafadhali wasilisha kwa mtafiti mwenyewe au wasimamizi wake. Anuani za wasimamizi hao ni:

Mtafiti

Msimamizi Na. 1

Msimamizi Na. 2

Noel Mark Makwinya
Edith Cowan University
School of Education
270 Joondalup Drive
JOONDALUP WA 6027
Mobile [REDACTED]
[REDACTED]
[REDACTED]

Assoc. Prof. Geoffrey W.
Lummis (PhD)
Edith Cowan University
School of Education
2 Bradford Street
Mount Lawley WA 6050
Mobile Ph: +61 410 032 563
Email: g.lummis@ecu.edu.au

Prof. David H. McKinnon
Edith Cowan University
School of Education
270 Joondalup Drive
JOONDALUP WA 6027
Mobile Ph: +61411315342
Email:
d.mckinnon@ecu.edu.au

Kama kutakuwa na jambo ambalo unadhan ni lazima uwasiliane na kulifikisha kwa mtu ambaye hausiki na tafiti hii moja kwa moja, basi unashauriwa kuwasiliana na:

Research Ethics Officer
Edith Cowan University
270 Joondalup Drive
JOONDALUP WA 6027
Phone: (08) 6304 2170
Email: research.ethics@ecu.edu.au

Hitimisho

Tafadhali zingatia kwamba:

- Tafiti hii imethibitishwa na Kamati inayoshughulia Maadili ya kitafiti ya ECU
- Endapo umejiandaa kuridhia ombi langu na kuruhusu shule yako kushiriki tafiti hii, nitaomba usaini fomu iliyoambatanishwa hapa chini.

Ahsante sana.

.....

Noel Mark Makwinya

Tarehe..... /..... 2017

APPENDIX 12

Consent Form to be filled by the school leader

Research Title:

Managing Science Teachers' Adoption of the 2005 Tanzanian Science Curriculum: School-Based Leaders' Practices and Achievements.



I, the undersigned, have thoroughly read an invitation letter concerning the research titled above. In addition to that, I had an opportunity to ask questions about the project and have them answered to my satisfaction. In this regard, I am aware that:

- (a) I can ask the researcher any further questions, should they arise.
- (b) The researcher is planning to:
 - Interview me;
 - Check various documents that I developed and used to guide teachers' curriculum implementation; and,
 - To observe various events and actions associated with the way I practically guide teachers' curriculum implementation.
- (c) The interview will be digitally audio-recorded and then transcribed (converted into typed text). Nevertheless, neither our conversation nor other data collection events will be video-recorded.
- (d) For the aim of protecting my privacy, all of the information that I will disclose to the researcher will be kept confidentially.
- (e) Any references to people and places in the transcripts, reports, and thesis will be replaced with pseudonyms. I am guaranteed that the data will be non-identifiable.
- (f) Together with the password-protected audio-recordings, all forms of data will be stored in a locked cabinet in a secure location at ECU for a maximum of five (5) years, after which they will be destroyed by ECU. While secured, data will only be accessible to members of the research team.
- (g) I can contact the researcher's supervisors (Professor David. H. McKinnon and Associate Professor Geoff Lummis) in case I: have any further queries; note any breach of these agreements; or, if I encounter any concern regarding this investigation. I am already provided with the contact details of these two supervisors in the Information Letter.
- (h) I have been provided with the contact details of an independent person to whom I can present any of my concerns or complaints about this research in case I wish to do so.
- (i) I am free to withdraw myself or information I have given the researcher at any time. In case I withdraw, I will not face any penalty. More importantly, there is no way the researcher will ask me why I have decided to withdraw.

In view of these, I confirm that I have willingly and voluntarily decided to participate in this research project.

Participant's signature **Date /..... 2017**

KIAMBATISHO CHA 12

Fomu ya kuridhia shule kushiriki tafiti

Fomu hii itajazwa na kusainiwa na kiongozi wa shule atakayeshiriki tafiti hii

Mada ya Tafiti

*Mapokeo ya Mtaala wa Mwaka 2005 wa Elimu ya Sekondari Tanzania
Katika Kufundishia Masomo ya Sayansi: Nafasi ya Uongoziwa Shule na
Mafanikio*



Mimi, niliyesaini hapo chini, nathibitisha kuwa nimepata fursa ya kusoma barua ya mwaliko wa kushiriki katika tafiti iliyotajwa hapo juu. Pia, nathibitisha kuwa nilipewa fursa ya kumuuliza maswali mbalimbali kuhusiana na tafiti hii. Kupitia nafasi hizi, nilijibiwa maswali mengi kwa kiwango cha kuridhisha. Nafahamu kwamba:

- (a) Naweza kuuliza tena swali au maswali ya ziada endapo yatajitokeza wakati tafiti ikiendelea
- (b) Mtafiti amedhamiria kunishirikisha kwa njia kuu nne:
 - mahojiano ya moja-kwa-moja kati yangu na yeye;
 - kujaza dodoso;
 - kuniangalia moja-kwa-moja namna ambavyo ninawaongoza waalimu wa sayansi kuutekeleza mtaala mpya; na,
 - kwa kusoma taarifa zilizomo kwenye nyaraka na dokumenti mbalimbali ambazo nimekuwa nikiziandaa kwa lengo la kufikisha miongozo kwa waalimu kuhusiana na mtaala huu.
- (c) Mahojiano yatahusisha unasaji wa sauti za maongezi. Hata hivyo, hii itatokana na ridhaa yangu kwani naweza kumzuia kufanya hivyo. Pia, zoezi zima la ukusanyaji wa taarifa halitahusisha uchukuaji wa video.
- (d) Kwa lengo la kutunza siri, taarifa zote nitakazompatia mtafiti atalazimika anazitunza ipasavyo. Pia atapokuwa anazitumia atahakikisha kuwa kwa namna yoyote hazitaweza kunibainisha mimi kama mhusika na wala shule yangu. Majina na utambuzi mbadala vitatumika badala ya majina halisi.
- (e) Pamoja na kutumia nywila kuzuia watu wasiohusika kuweza kusikiliza rekodi za sauti, taarifa zote nitakazompa mtafiti atalazimika kuzifungia kwenye chumbe maalumu kilichopo katika moja ya majengo ya chuo kikuu cha Edith Cowan kilichopo nchini Australia. Taarifa hizi zitatumizwa kwa kipindi kisichozidi miaka mitano (5). Huku zikiwa zimehifadhiwa, taarifa hizi zinaweza kufikiwa na mtafiti mwenyewe na wasimamizi wake ambao nimejulishwa kupitia barua ya mwaliko. Baada ya hapo, mtafiti kushirikiana na chuo watahikisha wanaziharibu rasmi kama maadili ya kitafiti yanavyosema.
- (f) Nawezapia kuwasiliana moja-kwa-moja na wasimamizi wa mtafiti huyu ambao ni profesa David. H. McKinnon and Profesa mshiriki Geoff Lummis, endapo:
 - Nitakuwa na dukuduku zaidi;
 - Nitakuwa na hoja au kuhitaji ufafanuzi; na,

- Nitakuwa na malalamiko yatakayosababishwa na uendeshaji wa tafiti hii.
- (g) Kama nitakuwa na haja ya kufikisha malalamiko juu ya tafiti hii kwa mtu ambaye hausiani na tafiti hii, nimepatiwa mawasiliano ya Afisa anayehusika na maadili ya Kitafiti ambaye naweza kumtumia
- (h) Kupitia mazungumzo yetu, tumekubaliana pia kuwa ushiriki wangu unazingatia uhuru. Hivyo, naweza kuamua kujitoa muda wowote bila ya kuulizwa wala kupewa adhabu au lawama yoyote.

Kutokana na makubaliano haya, natamka rasmi kuwa bila kulazimishwa na mtu yeyote nimeamua kushiriki katika tafiti hii.

Sahihi Tarehe /..... 2017

APPENDIX 13

Research Information and Invitation Letter



Dear **Science Teacher**,

I am conducting a research to fulfil the requirements of the degree of Doctor of Philosophy at Edith Cowan University (ECU). The title of a research project is, *Managing Science Teachers' Adoption of the 2005 Tanzanian Science Curriculum: School-Based Leaders' Practices and Achievements*

Objectives and expected outcomes

This study intends to examine two related issues. First, how school-based leaders have been guiding you to implement the 2005 Tanzanian Science Curriculum. Second, the extent to which such guidance has helped you to change from the teaching practices that were relevant for the superseded curriculum to the ones demanded by the 2005 Tanzanian Secondary School Curriculum.

As one of the study-participants, you will be requested to provide information about: (i) how school leaders guided you to understand and implement the 2005 Science Curriculum, and (ii) your curriculum implementation practice, which will help to show the extent to which you have utilised guidance you were given by leaders.

You are chosen to participate in this study because the researcher believes that you have good experience in implementing this curriculum. Therefore, you are a very important source of information needed for this study.

Findings obtained from this study will inform stakeholders about how the implementation of the 2005 Tanzanian curriculum is actually guided in schools. It is expected that such information might help school-based leaders to improvise additional change-guidance practices or improve the current ones. In turn, this improvement will help you and other teachers to change your teaching practices from those that were relevant for the superseded curriculum to the ones demanded by the current curriculum.

Methodology

Primarily, the researcher intends to collect the intended information using four different but related ways: These are:

- ❖ Face-to-face interviews with you. Kindly be informed that the interviews sessions are expected to last for one hour.
- ❖ Asking you to respond to a questionnaire. Kindly be advised that it will take approximately 45 minutes to fill in this questionnaire.
- ❖ Reviewing some of my teaching-planning documents, particularly the schemes of works and lesson plans.
- ❖ Observing the way you teach. This process is intended to be done using a walk through strategy.

Quality control and Ethics

Throughout the study, voluntary participation will be respected. Therefore, you will be free to withdraw yourself from the study at any time. You will also be free to withdraw any information that you might have already provided to the researcher. Importantly, you will neither face penalty nor asked why you have made any of such a decision. Any decision to withdraw will be respected as part of the investigation.

Another thing that you are assured of is about confidentiality. Kindly be informed that any information that you will provide about yourself or about the circumstance of your work will be kept confidentially. Together with the password-protected audio-recordings, all forms of data will be stored in a locked cabinet in a secure location at ECU for a maximum of five (5) years, after which they will be destroyed by ECU. While secured the data will only be accessible to members of the research team.

During data collection and analysis, the researcher's interest will be in the meanings of the things that:

- You will say concerning what and how you implement the new curriculum;
- You will say concerning how leaders are guiding you to implement the new curriculum;
- Will be observed when you are implementing the new curriculum; and,
- That will be revealed in the documents related to teaching. In particular, the focus will be on the lesson plans, schemes of works and bank of questions.

Therefore, you are guaranteed that the data will be non-identifiable. Care will be taken to ensure that neither your name nor that of the school in which you are working is revealed in the research products.

Finally, you are informed that the researcher will provide you with opportunities to check any analysis done and any conclusion made before results are officially published. Among many other reasons, this is aimed to give you an opportunity to:

- Cross-validate any interpretation that will be done; and,
- To determine the degree to which issues of confidentiality and privacy of yourself and of the information you provided were honoured.

Questions and/or further information

If you have any questions or require any further information about the research project, please contact the researcher himself or any of his two supervisors. Their contacts are:

The researcher

Noel Mark Makwinya
Edith Cowan University
School of Education
270 Joondalup Drive
JOONDALUP WA 6027
Mobile [REDACTED]
[REDACTED]
[REDACTED]

Principal Supervisor

Assoc. Prof. Geoffrey W.
Lummis (PhD)
Edith Cowan University
School of Education
2 Bradford Street
Mount Lawley WA 6050
Mobile Ph: +61 410 032 563
Email: g.lummis@ecu.edu.au

Associate Supervisor

Prof. David H. McKinnon
Edith Cowan University
School of Education
270 Joondalup Drive
JOONDALUP WA 6027
Mobile Ph: +61411315342
Email:
d.mckinnon@ecu.edu.au

If you wish to present any of your concerns or complaints about this research project to an independent person, you may use the following contact:

Research Ethics Officer
Edith Cowan University
270 Joondalup Drive, JOONDALUP WA 6027
Phone: (08) 6304 2170
Email: research.ethics@ecu.edu.au

Further information

Please note that:

- This project has been approved by the ECU Human Research Ethics Committee.
- This invitation letter is accompanied with a consent form. If you are prepared to allow your school to participate in this project, you are required to sign and return the mentioned consent form to me.

Thank you

.....

Noel Mark Makwinya

Date..... /.....2017

KIAMBATISHO CHA 13

Mwaliko wa Mwalimu wa Somo la Sayansi kushiriki kwenye Tafiti

Ndugu,

Naomba nikualike rasmi kushiriki kwenye tafiti ninayotarajia kuifanya. Tafiti hii ni sehemu ya masomo yangu ambayo yatapelekea kuhitimu Shahada ya Uzamivu ninayoyafanya katika Chuo kikuu cha Edith Cowan (ECU).



Mada ya tafiti ni: *Mapokeo ya Mtaala wa Mwaka 2005 wa Elimu ya Sekondari Tanzania Katika Kufundishia Masomo ya Sayansi: Nafasi ya Uongoziwa Shule na Mafanikio*

Malengo na faida tarajali:

Kama ujuavyo, Mitaala ya Tanzania imebadilishwa mwaka 2005 kutoka ule unaozingatia maarifai tu kwenda ule unaozingatia ujuzi (uwezo) na maarifa kwa pamoja. Licha ya mabadiliko hayo, hatuna taarifa za kutosha zinazobaini ni kwa kiasi gani waalimu wameweza kuimudu na kuitekeleza ipasavyo misingi ya mtaala mpya wa mwaka 2005. Sambamba na hilo, bado hatuna taarifa zinazoeleza ni kwa namna gani viongozi wa shule wamekuwa wakiwaongoza waalimu mashuleni kuumudu ufundishaji wa mtaala huu. Tafiti hii inakusudia kuziba mapungufu haya.

Endapo utakubali, ushiriki wako utalenga kunipatia taarifa zinazohusu mambo yote mawili. Yaani: (i) namna ambayo wewe binafsi umekuwa ukiongozwa na viongozi wa shule hii sio tu kuuelewa, bali pia kuufundisha mtaala mpya kadiri ya misingi yake, na (ii) namna ambavyo umekuwa ukiufundisha mtaala huo. Lengo la kukusanya taarifa hii ya pili ni kubaini kiwango ambacho ufundishaji wako umefaulu kuzingatia matakwa ya mtaala mpya.

Matokeo ya tafiti hii yana faida nyingi zinazotegewa. Moja ni kuwapa taarifa washika dau wote wa Elimu Tanzania kuhusiana na namna ambavyo mtaala wa mwaka 2005 wa elimu ya Sekondari Tanzania unasimamiwa na viongozi na kuzingatiwa na waalimu mashuleni. Ni matumaini yangu kuwa matokeo ya tafiti hii yatasaidia viongozi wa shule kubuni mbinu mbadala au kuziboresha zilizopo katika kuwasaidia waalimu kuumudu mtaala mpya kwa haraka. Kwa kufanya hivi, itasaidia kuharakisha uboreshaji wa ufundishaji mashuleni na hivyo kufikia malengo yaliyokusudiwa kwa haraka.

Mbinu za kitafiti zinazotarajiwa kutumiwa:

Ili kufanikisha tafiti hii, tafiti itajikita kukusanya taarifa kwa kutumia nia kuu nne. Nazo ni:

- mahojiano ya moja kwa moja. Mahojiano yataadumu kwa takribani saa moja.
- Kwa kupitia dodoso. Muda wa kulijanza hautazidi dakika 45.
- kukuangalia moja-kwa-moja namna ambavyo unautekeleza mtaala mpya.
- kwa kusoma taarifa zilizomo kwenye andalio la somo, maazimio ya kazi na dokumenti nyingine mbalimbali ambazo umekuwa ukiziandika kuhusuiana na ufundishaji

Miiko ya kitafiti:

Unafahamishwa kuwa taratibu zote za tafiti hii zitazingatia misingi ya ushiriki huru na usiri wa taarifa za mshiriki na maeneo yake. Kuhusiana na uhuru, unahakikishiwa kuwa uamuzi wako wa kushiriki unatakiwa uwe wenye uhuru mkubwa. Unaweza unaweza kujitoa wewe mwenyewe au kuomba baadhi ya taarifa ulizozitoa ziondolewe siku yoyote. Endapo utafanya maamuzi ya aina hii, unaombwa ufahamu kuwa hautaulizwa wala kuadhibiwa kwa na namna yoyote na mtu yeyote. Mtafiti anafahamu kuwa hiyo ni haki yako ya msingi.

Kuhusiana na usiri, unataarifiwa kwamba taarifa unazozitoa kuhusu wewe mwenyewe mazingira yako ya kazi hazitatolewa kwa mtu yeyote. Unataarifiwa pia kuwa tarifa zitazokusanywa zitahifadhiwa kwenye chumba chenye makabati maalumu ambayo yanafungwa kwa kufuli maalumu kilichopo katika chuo kikuu cha Edith Cowan nchini Australia kwa kipindi kisichozidi miaka mitano (5). Wakati zimehifadhiwa, taarifa zitakuwa zinaweza kufikiwa na mtafiti mwenyewe pamoja na wasimamizi wake. Baada ya hapo, mtafiti atawasiliana na uongozi wa chuo ili kuziharibu rasmi.

Wakati wa kukusanya na kuzichambua taarifa, mtafiti atalenga kubaini maana ya mambo na vitu ambavyo:

- Utavisema kuhusiana na namba ambayo viongozi wa shule wanakuongoza kuutekeleza mtaala mpya;
- Utaonekana unatekeleza mtaala mpya;
- Utavibainisha kwenye dodoso; na
- Vitasomwa kwenye nyaraka na dokument mbalimbali za kiufundishaji ulizowahi kuziandaa

Kwa hiyo basi, unahakikishiwa kuwa taarifa hizi zitatumika katika hali ambayo haziwezi kukubainisha wewe au mazingira yako. Kutakuwa na umakini mkubwa kuhakikisha kuwa jina lako na la mzingira yako ya kazi havitahitajika au kutumika wakati wa tafiti hii.

Mwisho kabisa, unataarifiwa kuwa kabla taarifa zilizokusanywa hazijachapishwa, utapewa nakala inayoonyesha zilivyotumika pamoja na namna mbayo taarifa zilitafsiriwa. Lengo la kufanya hivi ni:

- Kukupa nafasi ya kuzihakiki, kuzipima na kujiridhisha ni kwa kiwango gani masharti haya yameheshimika.
- Kukuwezesha kukagua uhalisia na ubora wa tafsiri iliyofanyika

Malalamiko na maswali ya ziada

Kama una maswali au dukuduku, tafadhali wasilisha kwa mtafiti mwenyewe au wasimamizi wake. Anuani za wasimamizi hao ni:

Mtafiti

Noel Mark Makwinya
Edith Cowan University
School of Education
270 Joondalup Drive
JOONDALUP WA 6027
Mobile Ph: [REDACTED]
[REDACTED]
[REDACTED]

Msimamizi Na. 1

Assoc. Prof. Geoffrey W.
Lummis (PhD)
Edith Cowan University
School of Education
2 Bradford Street
Mount Lawley WA 6050
Mobile Ph: +61 410 032 563
Email: g.lummis@ecu.edu.au

Msimamizi Na. 2

Prof. David H. McKinnon
Edith Cowan University
School of Education
270 Joondalup Drive
JOONDALUP WA 6027
Mobile Ph: +61411315342
Email: d.mckinnon@ecu.edu.au

Kama kutakuwa na jambo ambalo unadhan ni lazima uwasiliane na kulifikisha kwa mtu ambaye hausiki na tafiti hii moja kwa moja, basi unashauriwa kuwasiliana na:

Research Ethics Officer
Edith Cowan University
270 Joondalup Drive
JOONDALUP WA 6027
Phone: (08) 6304 2170
Email: research.ethics@ecu.edu.au

Hitimisho

Tafadhali zingatia kwamba:

- Tafiti hii imethibitishwa na Kamati inayoshughulia Maadili ya kitafiti ya ECU
- Endapo umejiandaa kuridhia ombi langu na kuruhusu shule yako kushiriki tafiti hii, nitaomba usaini fomu iliyoambatanishwa hapa chini.

Nakushukuru sana.

.....

Noel Mark Makwinya

Tarehe..... / 2017

Appendix 14

Consent Form for the Science teacher

Research Project Title

Managing Science Teachers' Adoption of the 2005 Tanzanian Science Curriculum: School-Based Leaders' Practices and Achievements



I, the undersigned, have thoroughly read an invitation letter concerning the research titled above. In addition to that, I had an opportunity to ask questions about the project and have them answered to my satisfaction. In this regard, I am aware that:

- (a) I can ask the researcher any further questions, should they arise.
- (b) The researcher is planning to:
 - Interview me.
 - Check documents that I developed and used when adopting the new curriculum.
 - To observe the live events and actions associated with the way I actually implement the new curriculum.
- (c) The interview will be digitally audio-recorded and then transcribed (converted into typed text). Nevertheless, neither our conversation nor other data collection events will be video recorded.
- (d) For the aim of protecting my privacy, all of the information that I will disclose to the researcher will be kept confidentially.
- (e) References to people and places in the transcripts, reports, and in the thesis will be replaced with pseudonyms. I am guaranteed that the data will be non-identifiable.
- (f) Together with the password-protected audio-recordings, all forms of data will be stored in a locked cabinet in a secure location at ECU for a maximum of five (5) years, after which they will be destroyed by ECU. While secured, data will only be accessible to research team members.
- (g) I can contact the candidate's supervisors (Professor David. H. McKinnon and Associate Professor Geoff Lummis) in case I will have any further queries; note any breach of these agreements; and/or, in case I will encounter any concern regarding the investigation. I am already provided with the contact details of these two supervisors in the Information Letter.
- (h) I have been provided with the contact details of an independent person to whom I can present any of my concerns or complaints about this research in case I wish to do so.
- (i) I am free to withdraw myself or information I have given the researcher at any time. In case I withdraw, I will not face any penalty. More importantly, there is no way the researcher will ask me why I have decided to withdraw.

In view of these, I confirm that I have willingly and voluntarily decided to participate in this research project.

Teacher's signature

Date /.....

2017

KIAMBATISHO CHA 14

Fomu ya kuridhia kushiriki kwenye tafiti (Fomu hii itajazwa na kusainiwa na Mwalimu wa Somo la Sayansi)

Mada ya Tafiti: *Mapokeo ya Mtaala wa Mwaka 2005 wa Elimu ya Sekondari Tanzania Katika Kufundishia Masomo ya Sayansi: Nafasi ya Uongoziwa Shule na Mafanikio.*



Mimi, ambaye nimesaini hapa chini, nathibitisha kuwa nimepata fursa ya kusoma barua ya mwaliko wa kushiriki katika tafiti iliyotaja hapo juu. Pia, nathibitisha kuwa nilipewa fursa ya kumuuliza maswali mbalimbali kuhusiana na mradi huu. Kupitia nafasi hizi, nilijibiwa kwa kiwango cha kuridhisha. Kupitia fursa hizo, tumekubaliana kwamba:

- (a) Naweza kuuliza tena swali au maswali ya ziada endapo yatajitokeza wakati tafiti ikiendelea
- (b) Mtafiti amedhamiria kunishirikisha kwa njia kuu nne:
 - mahojiano ya moja-kwa-moja kati yangu na yeye juu ya utekelezaji wa mtaala;
 - kujaza dodoso zinazopima mtazamo wangu juu ya mtaala mpya;
 - kuniangalia moja-kwa-moja namna ambavyo ninafundisha masomo yangu na kuutekeleza mtaala mpya; na,
 - kwa kusoma taarifa zilizomo kwenye maazimio ya kazi, maandalio ya somo na nyaraka na dokumenti nyingine ambazo nimekuwa nikiziandaa na kuzitumia kwa kufundisha.
- (c) Mahojiano yatahusisha unasaji wa sauti za maongezi. Hata hivyo, hii itatokana na ridhaa yangu kwani naweza kumzuia kufanya hivyo. Pia, zoezi zima la ukusanyaji wa taarifa halitahusisha uchukuaji wa video.
- (d) Kwa lengo la kutunza siri, taarifa zote nitakazompatia mtafiti atalazimika anazitunza ipasavyo. Pia atapokuwa anazitumia atahakikisha kuwa kwa namna yoyote hazitaweza kunibainisha mimi kama mhusika na wala shule yangu. Majina na utambuzi mbadala vitatumika badala ya majina halisi.
- (e) Pamoja na kutumia nywila kuzuia watu wasiohusika kuweza kusikiliza rekodi za sauti, taarifa zote nitakazompa mtafiti atalazimika kuzifungia kwenye chumbe maalumu kilichopo katika moja ya majengo ya chuo kikuu cha Edith Cowan kilichopo nchini Australia. Taarifa hizi zitatumizwa kwa kipindi kisichozidi miaka mitano (5). Huku zikiwa zimehifadhiwa, taarifa hizi zinaweza kufikiwa na mtafiti mwenyewe na wasimamizi wake ambao nimejulishwa kupitia barua ya mwaliko. Baada ya hapo, mtafiti kushirikiana na chuo watahikisha wanaziharibu rasmi kama maadili ya kitafiti yanavyosema.

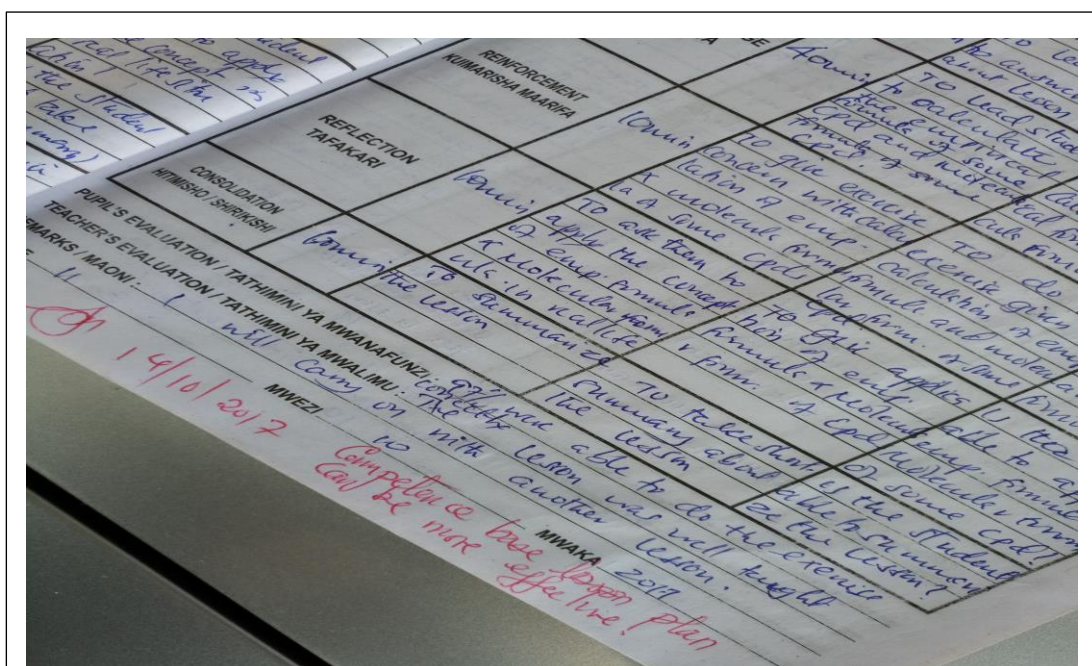
- (f) Nawezipia kuwasiliana moja-kwa-moja na wasimamizi wa mtafiti huyu ambao ni profesa David. H. McKinnon and Profesa Mshiriki Geoffrey Lummis, endapo nitakuwa na: dukuduku zaidi; na hoja au kuhitaji ufafanuzi; na, endapo nitakuwa na malalamiko yatakayosababishwa na uendesaji wa tafiti hii. Kama nitakuwa na haja ya kufikisha malalamiko juu ya tafiti hii kwa mtu ambaye hausiani na tafiti hii, nimepatiwa mawasiliano ya Afisa anayehusika na maadili ya Kitafiti ambaye naweza kumtumia
- (g) Kupitia mazungumzo yetu, tumekubaliana pia kuwa ushiriki wangu unazingatia uhuru. Hivyo, naweza kuamua kujitoa muda wowote bila ya kuulizwa wala kupewa adhabu au lawama yoyote.

Kutokana na makubaliano haya, natamka rasmi kuwa bila kulazimishwa na mtu yeyote nimeamua kushiriki katika tafiti hii.

Sahihi ya Mwalimu wa Sayansi..... Tarehe:...../..... 2017

Appendix 15

Typical SBLs' comments on Science teachers' Lesson Planning



MAANDALIO YA SOMO (TEACHER'S LESSON PLAN)									
TAREHE (DATE)		SOMO (SUBJECT)	DARASA (STD)	KIPINDI (PERIOD)	MUDA (TIME)	IDADI YA WANAFUNZI (NO. OF PUPILS)		WALIOANDIKISHWA (REGISTERED)	
						ME	KE	JUMLA	ME
20/10/17		Chem	IC	SB	80				
UJUZU To be able to apply scientific procedure to carry out investigation LENGU KUU To let them to have concept of scientific procedures MADA KUU Scientific procedure MADA NDOGO Significance of the scientific procedure MALENGO MAHUSISHA The end student should be able to explain the concept of scientific procedure ZANA / VIFAA A chart of scientific procedures REJEA / REFERENCE Chem a school book one class COX and university press									
TEXT BOOKS (VITABU VYA KIADA)			REFERENCE BOOKS (VITABU REJEA)			SUPPLEMENTARY BOOKS (VITABU VYA ZIADA)			
ZANA / VIFAA A chart of scientific procedures									
MTIRIRIKO WA MASOMO									
STAGES HATUA	MINUTES DAKIKA	TEACHING ACTIVITIES VITENDO VYA UFUNDISHAJI	PUPILS LEARNING ACTIVITIES VITENDO VYA UJIFUNZAJI	ASSESSMENT VITENDO VYA UPIMAJI					
INTRODUCTION UTANGULIZI	10 min	To ask oral questions about the previous lesson	To answer oral qns asked	Is the student able to answer qns correctly?					
NEW KNOWLEDGE UJUZU MPYA	40 min	To lead discussion on about significance of scientific procedure	To participate by giving their point of view on importance of scientific procedure	Is the student able to explain significance of scientific procedure?					
REINFORCEMENT KUIMARISHA MAARIFA	10 min	To give them exercise about the significance of scientific procedure	To answer qns about significance of scientific procedure	Is the student able to answer qns on scientific procedure?					
REFLECTION TAFAKARI	10 min	To ask them to give overview about the lesson	To give overview about the lesson	Is the student able to give their overview about the lesson?					
CONSOLIDATION HITIMISHO / SHIRIKISHI	10 min	To summarize the lesson	To take short summary about the lesson	Is the student able to take short summary?					
PUPIL'S EVALUATION / TATHIMINI YA MWANAFUNZI: 99% were able to answer qns correctly									
TEACHER'S EVALUATION / TATHIMINI YA MWALIMU: The lesson was well taught									
REMARKS / MAONI: I will carry on with another lesson.									
TAREHE 20		MWEZI		MWAKA 2017		21/10/17			