INVESTIGATING THE EXTENT TO WHICH THE UTILIZATION OF THE STUDENTS' CENTRED PEDAGOGIES IMPACT THE MALAWI NATIONAL YOUTH POLICY: THE CASE OF STRENGTHENING MATHEMATICS AND SCIENCE IN SECONDARY EDUCATION TRAINED TEACHERS IN BALAKA DISTRICT

M.ED (POLICY, PLANNING AND LEADERSHIP) THESIS

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M. Ed (Policy, Planning and Leadership) Thesis

By

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Submitted to the Department of Education Foundation, School of Education, in partial fulfillment of the requirement for the degree of Master of Education (Policy, Planning and Leadership)

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DECLARATION

I, the undersigned, hereby declare that this thesis is my own original work and it has not been submitted before to any other University for similar purposes. Where other people's work has been used, acknowledgements have been made.

FELIX DANIEL DZONZI KUSAMBA

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Full legal Name

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Signature

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Date

CERTIFICATE OF APPROVAL

The undersigned certify that this thesis represents the student's own work and effort and has been submitted with our approval.

Signature_____ **Date**_____

Dorothy Nampota, PhD (Professor)

Main Supervisor

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Co-Supervisor

DEDICATION

This work is dedicated to my father the Late Gabriel Kusamba Dzonzi, my mother Velentina Mzowa who has lived her life to support me in every respect up to date. It is also dedicated to my brothers Henry Kusamba Dzonzi, Alexander Kusamba Dzonzi and Justin Kusamba Dzonzi who labored to pay for my school fees plus the entire family for the support given when the going got tough. Last but not least to my wife Martha and my two daughters Velentina and Fesiana who shall have the privilege of following my footsteps and appreciate this work later in their life.

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ABSTRACT

The purpose of the study was to investigate the extent to which the utilization of the student centred pedagogies impacted the Malawi National Youth Policy. It further investigated the challenges teachers encountered in the implementation of the pedagogical approaches gained from the Strengthening of Mathematics and Science in Secondary Education (SMASSE). The study took a mixed research design. The sample size was sixteen (16) science teachers selected randomly. The data were collected using lesson observations and individual interviews. The study used SMASSE's concepts of student centred pedagogies of Student Activities (A), Student Centred approaches (S), Experimentation (E) and Improvisation (I) of teaching and learning resources (ASEI), Planning of work (P), Doing the work (D), Seeing the work (S) and Improving (I) (PDSI), as a conceptual and analytical framework. The study found that teachers used student activities (A) and improvisation (I) in the classrooms. However, the activities did not appear to enhance student centredness (S) and Experimentation as much as it is desired by the Malawi National Youth Policy in creating the needed human capital for development through education. This finding showed that SMASSE has medium positive impact to the Malawi National Youth Policy in Balaka. With regards to PDSI, while all teachers planned schemes of work, only some teachers plan lessons while the majority just used lesson notes. The study was, therefore, necessary in that it has shown that teachers are contributing to the implementation of the Malawi National Youth Policy by developing students as future human capital for Malawi. With regard to the results, this study concludes that SMASSE trainings were positively impacting the pedagogical practices of the teachers thereby contributing positively to the Malawi National Youth Policy. Students need to be encouraged to communicate in English at all levels.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACME	: Advisory Committee on Mathematics Education
ASEI	: Students Activities, Students Centred, Experiment and Improvisation.
CDSS	: Community Day Secondary School
DEO/DEM	: District Education Officer/ District Education Manager
DTED	: Department of Teacher Education
EQUIP	: Education Quality Improvement through Pedagogy
FPEP	: Free Primary Education Policy
GoJ	: Government of Japan
GoK	: Government of Kenya
GoM	: Government of Malawi
GoT	: The Government of Tanzania
GoZ	: Government of Zimbabwe
HoDS	: Heads for Science Department
HT	: Head teacher
JCE	: Malawi Junior Certificate of Education
JICA	: Japanese International Cooperation
MANEB	: Malawi National Examinations Board
MGDS	: Malawi Growth and Development Strategy
MIITEP	: Malawi Integrated In-service Teacher Education Project
MNYP	: Malawi National Youth Policy
MoEST	: Ministry of Education, Science and Technology
MPRS	: Malawi Poverty Reduction Strategy Paper
MSCE	: Malawi School Certificate of Education
MUSTER	: Multisite Teacher Education Resource Project
NYP	: National Youth Policy
OECD	: Organization for Economic Cooperation and Development Organization
PDSI	: Plan, Do, See and Improve
SADC	: Southern Africa Development Community Secondary Schools
SEED	: South East Education Division
SMASSE	: Strengthening Mathematics and Science in Secondary Education
TALULAR	: Teaching and Learning Using Locally Available Resources

TCPD	: Teacher Continued Professional Development
TINSET	: Teacher In-service Training
UK	: United Kingdom
UNESCO	: United Nations Educational, Scientific and Cultural
USA	: United States of America

CHAPTER ONE

INTRODUCTION

1.1 Introduction and background

This chapter provides the background to the study, highlighting the context in which improved methods for science teaching are located. It explains the importance of education in youth policies and socioeconomic development of a nation. The chapter also presents the problem statement, purpose of the study, research questions, and the significance of the study as well as its limitations.

1.2 Science education and socioeconomic development

The linkage between education of good quality and socio-economic development is no longer questioned. Quality education has been described as one of the major tools for increasing economic competitiveness and national development, apart from the endowment of natural resources (Ogbonnaya, 2011). However, for this to happen, there is a need for an education that promotes the use of pedagogical skills that ensure that quality teaching and learning takes place, and this is especially true for science education to the youth (Ogbonnaya, 2011; Shindell, 2011). Education is vital because it reduces poverty, fostering healthy lifestyles, encourage life skills and competitiveness in one's life (UNESCO, 2010).

The youths that are properly educated become very productive in their societies. They raise their chances of accessing decent jobs thereby reducing poverty and unemployment (UNESCO, 2010). The Malawi Growth and Development Strategy (MGDS II) prioritized the development for the youth through education (GoM, 2013). The National Youth Policy in Malawi consulted widely to revise the empowerment of the youth to participate in economic development (p.4). The government of Malawi recognizes the importance of education in general and science education, in particular, for national development for the youth (GoM, 2008 and 2013).

In responding to the need for socioeconomic development for example, the Malawi government developed an overarching policy of poverty reduction strategy known as Malawi Growth and Development Strategy (MGDS) I whose successful implementation led to the MGDS II (GoM, 2006; GoM, 2013). MGDS II spells out six thematic areas that identify science and technology education as one key priority within priorities for the five-year period of 2011 to 2016 (MPRSP, 2006). The MGDS III covers the period from 2017 to 2022. This period includes the three last years of the Vision 2020 long term policy (GoM, 2017). MGDS III is aimed at creating productive and competitive nation premised on adequate capacity building.

In terms of capacity building, the MGDS III adopted the Istanbul Programme Action which emphasizes on human capacities by fostering sustained, equitable and inclusive human and social development. The education sector should ensure that education is inclusive and equitable whilst ensuring that there is high quality education offered in schools (GoM, 2017). In Malta, the National Youth policy hinged on developing the youth for equitable economic and social progress for all the youths and helping to address their needs and aspirations (the Malta National Youth Policy, 2015).

In order to actualize the aspirations for improving the socio-economic development of the country through investment in science and the youths, the Malawi government developed the National Youth policy with the purpose of developing the much needed human resources for development (GoM, 2013). The human development for the youth through the youth policy merged very well with the Science and Technology policy that was developed in 1991. It was revised in 2002 because the world affairs showed that successes in science education led to the socioeconomic development in

other countries (GoM, 2002). SMASSE Malawi and the science policy made the science education to popularize among the youths as the youth policy enshrined in its policy statements (GoM, 2013).

The Science and Technology policy in Malawi also responds to Vision 2020 which expresses the need for incorporation of science and technology if Malawi endeavors to develop economically (GoM, 2004). The Vision 2020 emphasized the need for a scientifically and technologically driven economy by the year 2020. The Vision 2020 policy states the aspirations of the Malawi government that by 2020 it should achieve a middle income status (GoM, 2007). Malawi needs to implement the youth policy so that the youth should take an active role in national development. However, it should be noted that the attainment of the vision enshrined in the Vision 2020, MGDS I and II, and the Science and Technology policy depends on the science teachers who implement quality science education to the citizenry in Malawi. Quality education hinges on active teaching and learning pedagogies which teachers need to utilize in order to be effective in the classrooms (Shindell, 2011). Such pedagogies are said to be superior to the rote learning pedagogies which lead to cramming of basic scientific knowledge to the youth.

1.2.1 Science education in secondary schools

In Malawi, secondary education is offered through three different types of schools; conventional, Community Day and Private secondary schools. The different types of schools follow the same syllabus though they have different resources. The CDSS for example, though enrolling the majority of the secondary school students in the country, do not have laboratories and qualified teachers in science and technology subjects. Yet, they have to teach the same science syllabus that the conventional secondary schools teach.

1.2.2 Student centered pedagogies of SMASSE

Quality education, especially learning achievement in mathematics and science education, is achieved through student centred pedagogies (GoK, 2013). Research shows that teachers who implement the educational policies acquire student centred pedagogies from teacher in service trainings in many countries (Factoran, 2009).

In its commitment to implement the youth policy, the government of Malawi endeavored to improve the quality of education by increasing the numbers of trained teachers in science and mathematics being the core subjects at secondary school level. The Malawi National Youth Policy states that all stakeholders have the responsibility of providing quality education to the youth and time dedicated for their development (GoM, 2013). As the government trains and allocates qualified teachers to teach science at secondary school, she develops the youth as a human resource required in the industries.

It was against this background that the Malawi government supported Ministry of Education, Science and Technology (MoEST) in adopting a mandatory programme of Strengthening Science and Mathematics in Secondary Education (SMASSE) with emphasis on adopting learner centred pedagogies in order to deliver quality science education to the youth (GoM, 2001). The Japanese government, in collaboration with the Malawi government, observed that education in Malawi is suffering from lack of qualified science teachers and poor pedagogical skills. The pedagogical skills were mostly teacher centred in science subjects more especially in rural areas and Community Day Secondary Schools (CDSSs) GoM, 2001).

The government of Kenya once observed that the quality of education was poor due to poor teaching pedagogies but by adopting the SMASSE concept of ASEI/PDSI, quality of education improved resulting into high students' achievements in science subjects (GoK, 2013). The success and failure of the education system rests on his shoulder that is why teachers need to be trained continuously in order to improve the quality of education (Factoran, 2009; Rahman, et al, 2011). It is expected that students' achievement will improve in science education because of SMASSE Malawi although Chief examiners' reports from MANEB show that the performance is poor than in other subjects. Table 1 shows some of the adjectives used to describe students' performance:

Table 1: Adjectives used for students' performance at MSCE

Science Subject	**Adjectives used**	**Other subjects**	**Adjectives used**	**Year**
Mathematics	Lacked mastery	Social studies	Much better	2017
Physical Science	Inadequate	Life Skills	Better	2017
	mastery	English	Better	2017
Mathematics	Average	-Bible Knowledge - Geography - English	Far much Better than previous year Better Good	2016
Physical Science	Very disappointing	Life Skills	Better than previous year	2016
Mathematics	Below average	Bible Knowledge	Better	2011
		English	satisfactory	2010
Mathematics	Average	Chichewa	Better	2009

Table 1 shows that students' performance at national examinations is still about average for a long time now. Kamoto (2017) also found that mathematics education in Malawi faced problems in students' performance at secondary school due to lack of quality teachers and poor teaching pedagogies in which the teacher had more talk time than the students in class. That study found that mathematics teachers utilized the didactic pedagogies that were more teacher centred against the students centred pedagogies that SMASSE advocates to science teachers. Secondary school teachers in Malawi were using teacher centred pedagogies before the coming in of SMASSE in service trainings for science teachers (Tindi, 2010). SMASSE came to ingrain teachers in student centred pedagogies in science subjects in Malawi, just like in Kenya. SMASSE has equipped teachers with understanding of the topics and their pedagogical skills over the years (Kuzemba, 2006). The general performance of the students reflect the quality of education and indeed the quality of teaching and learning pedagogies offered in class in Malawi (Selemani-Meke, 2011).

For science education to contribute to the development of the youth and the Malawi National Youth policy, the quality of teaching and learning has to be at a level where students learn in a meaningful way. Teachers should embrace appropriate pedagogies and gain mastery of the subject matter (Kamoto, 2017). This calls for the use of active teaching and learning approaches in science education (Shindell, 2011).

1.3 Problem Statement

Student's performance at national examinations is still low despite the fact that science teachers are being trained by SMASSE in student-centred pedagogies. An analysis of students' performance in specific subjects and departments showed that the science department experiences poor performances in national examinations as well as school based tests compared to other departments and subjects in Malawi, both at JCE and MSCE levels (MSCE Chief Examiners Reports for Biology, 2008, 2009, 2011; Mathematics 2006 to 2011; Physical Science, 2008, 2011 as cited by Moyo & Thomo, 2012).

Chief examiners appropriately used signaling adjectives to compare the general performance of various subjects at national level as analyzed in proceeding sections. Such adjectives are italicized in this section to emphasize the comparison. The 2012 JCE Mathematics Chief Examiner's Report showed that the general performance by candidates was *average to good*. *Most* answers were incomplete or *wrong* while in the same year, general performance in Bible Knowledge was *far much better* than *any* year before which was 2011 (B/K Chief Examiner's Report, 2012).

Performance at MSCE level in Geography in the same year was labeled *better* than *previous* year (MSCE Geography Chief Examiner's Report, 2012). Similarly, the 2012 Geography JCE Chief Examiner's report showed that students had knowledge of the subject matter though they forgot what was taught. In the same year, candidates scored *good* marks in JCE English (English Chief Examiner's Report, 2012) though *poor* performance came from Open Secondary Schools. From the above evidence, it can be said that students' performances at national examinations are still poor. This reflects the utilization of the teacher centred pedagogies that did not engage the students in the learning process.

One wonders how SMASSE is contributing to the implementation of the Malawi National Youth policy and the quality of science education in Malawi. GoM (2013) observed that the pass rates for JCE and MSCE are poorer in CDSS than conventional secondary schools in Malawi (Mlangeni and Chiotha, 2015). That was why this study was done in the CDSS to find out the utilization of SMASSE approaches among the teachers.

The questions we can ask now are: Do Mathematics and Science teachers utilize the pedagogical skills gained from SMASSE trainings in order to improve the quality of education? If yes, to what extent do they utilize it? Is the science education contributing to the implementation of the Malawi National Youth policy? What are the challenges, if any, that affect teachers when implementing the student centred pedagogies in their classrooms?

1.4 Purpose of the Study

The purpose of this study was to investigate the extent to which Community Day Secondary School Mathematics and Science teachers utilize the knowledge and skills gained from SMASSE trainings in the teaching and learning process. It further investigated the challenges Mathematics and Science teachers encounter as they implement the knowledge and skills gained from SMASSE training to students.

1.5 Research Questions

This study was guided by the following three major questions:

1. What pedagogical knowledge and skills do teachers gain from SMASSE
   trainings?
2. To what extent do teachers utilize the pedagogical knowledge and skills
   gained in the actual classrooms?
3. What challenges (if any) do teachers encounter when utilizing the gained
   pedagogical skills?

1.6 Significance of the Study

Firstly, the study adds to the existing literature on the impacts of teacher CPD insets on teachers' effectiveness and students' performance as noted by Gwede, (2005). Secondly, this study provides information to policy makers, SMASSE CPD facilitators, researchers and the MoEST to see to it that students benefit from such initiatives**.** Lastly, the study deepened my understanding of the processes SMASSE use to impart knowledge and skills to teachers who attend the annual sessions.

1.7 Chapter summary

This chapter has explained the relationship between science education and the development of students' potentials as the potential human capital for a country. Despite that there are low performances of students in Malawi due to the utilization of teacher centred pedagogies, education is the main catalyst for developing the human capital in the youth and the national development of a country. The next chapter is literature review.

1.8 Definitions of Terms

Education: Is the process of teaching, training and learning especially in schools or colleges to improve knowledge and develop skills (Hornby, 2009, p.467).

In-service: Is the preparation of individuals while they are at the job (Flexner & Hauck, 1983, p.986).

Knowledge: Is the acquaintance with facts, truth, principles, information, understandings and skills that a person acquires through education and training. It refers to the organized body of information shared by people in particular field such as science (Flexner & Hauck, 1983, 1064).

Skills: refers to the ability of an individual to do something well while paying attention to great detail (Flexner & Hauck, 1983, 1791)

Youth: Is the time of life when a person is not an adult (Hornby, 2009, p.1713)

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Chapter Overview

The purpose of this study was to investigate the extent to which Community Day Secondary School (CDSS) mathematics and science teachers' utilization of the pedagogical skills gained from SMASSE trainings impacted the youth policy in Malawi. In view of this, the current chapter reviews the studies done on common factors that affect teacher learning and science teachers' classroom practices in their teaching process, the role of teachers' continued professional developments (TCPDs) in developing the youths through science education. It further discusses the youth policies around the world. The chapter also provides a reviews of SMASSE Africa, what it has done. It also reviews science education globally and finishes with the theoretical framework guiding the study.

2.1.1 Youth policies and youth education in some countries

Youth policies are recognized as crucial in national development around the world. The Youth policy in the United Kingdom such as England, Scotland, Wales and Northern Ireland is backed by the Children's Act (2004) on the wellbeing and development of the youth in the member countries (UK, 2010). The stakeholders and authorities are obliged by the law to cooperate with partners to achieve development of the youth. As such, the authorities are expected to provide youth support services especially quality education and youth work so that they achieve their highest potentials in developing their skills. The skills obtained from student centred pedagogies will enable them participate actively in national developments and decision making that affect development.

In South Africa, the National Youth policy has the overall objective of strengthening the capacity of key youth development skills and ensure the integration of coordination in the delivery of youth services, especially science education. The policy stipulated that the government should build the capacity of young people through education, to enable them take charge of their wellbeing, realize their potentials and meaningful contributions to the national development.

The policies intend to increase the skills levels of the youths in order to increase the youths' chances of being gainfully employed because low skills level negatively affects national development. The low skills emanate from poor quality science education, lack of well-developed human capital and high unemployment rates. UNESCO (2010) observed that the youths who are inadequately educated in secondary education mathematics and science skill fail to participate actively in economic development in Latin America. Such youths fail to secure a gainful employment and contribute meaningfully to the national as well as societal development.

In Tanzania, the Youth policy recognized the need for human development, especially the youths (GoT, 2007). The policy identified the youths as human capital which is a critical ingredient for socioeconomic development and poverty eradication. Specifically, the policy intended to facilitate for the youths to acquire scientific skills and competencies for employment through schooling. The government of Tanzania strengthened public education institutions to provide services to the youth developments effectively and efficiently (GoT, 2007).

In Zimbabwe, the Youth Policy intended to equip the youth educational skills development to ensure equitable distribution in rural and urban areas. The skills, the youths gained from the education system through proper instructions in class and appropriate language for their understanding, promoted industrial exposure to the students (GoZ, n.d).

In Malawi, the National Youth policy was advocated in MGDS II recognizing the youths as key to national development. The policy pointed out that the youth are energetic, adventurous, industrious, strong, healthy and willing to learn (UNESCO, 2010). MGDS realized that science education develops the capabilities of the youths, enrich their knowledge and improve their technical skills that raise their employability (UNESCO, 2010). The youths, that are actively trained and taught, acquire necessary skills from the education system. This creates a potential human resource in industries and development related sectors.

2.1.2 Factors that affect teacher performance

Literature identified a number of factors that teachers encounter as they deliver the curriculum to students in the classroom. Research has found that the major factors that affect teachers' performance were teachers' mastery of the subject matter and their pedagogical skills (Odawa et al., 2014; Tindi, 2010 and Akram, 2010). Teachers deliver effective lessons to the students if they have sufficient knowledge of the subject matter and the general pedagogies suitable for the students (Shulman, 1986).

Ball and McDiamid (n.d) stated *that "If anything is to be regarded as a specific preparation for teaching, priority must be given to a thorough grounding in something to teach"* (p.151). Knowledge of the subject matter enables the teachers to interpret the topics which are best imparted to the students upon utilization of the suitable pedagogical skills (Akram, 2010; Shulman, 1986). A teacher needs to understand what to teach as Buchman once said as follows:

> *It would be odd to expect a teacher to plan a lesson on, for instance, writing reports in science and to evaluate related student assessments, if that teacher is ignorant about writing and about science, and does not understand student progress in writing science reports might mean (cited by Ball & McDiamid, n.d,* pp.8-9)

Ball & McDiamids, (n.d) above pointed out that effective and efficient lesson delivery depends on the use of pedagogical skills. This means that teachers with little knowledge of the subject matter and the pedagogical skills struggle to deliver effective lessons in class (Odawa et al., 2014). Knowledge of the subject matter and the pedagogical skills has positive impact on the students. Subject matter contributed to the effectiveness of teachers in the delivery of their lessons (Nampota & Seleman-Meke, 2014; Kunje, 1996; Harris & Sass, 2008; Inyega, 2005; de Souza Barros & Elia, 1998; Adeyinka et al, 2013).

However, studies indicated that there was a gap between acquisition of the pedagogical knowledge and change in classroom practices (Mukeredzi, 2013). In the study above¸Mukeredzi, (2013) argued that for teachers to utilize their pedagogical skills in class, they need to change their classroom practices by attending teacher professional development trainings. Mukeredzi (2013) emphasized the significance of the teacher professional development quoting Guskey (2002) saying, "…never has there been a greater recognition of the importance of teacher professional development" (p. 88). Teacher professional development enables teachers to be effective and efficient especially if the training drills them on subject matter and teaching pedagogies.

2.2 Teacher Continuing Professional Development

As research has shown, teacher professional development plays a great role in improving the quality of teachers and student performance. This section explores teacher professional developments in selected countries. It draws examples from America, Europe and Africa.

2.2.1 Teacher Professional Development in some countries in America

Studies in some countries in North America found that there was a positive association between teacher effectiveness and content-focused teacher professional development (Harris & Sass, 2007). Similarly, in South America, Peru, Schiefelbein & Simmons, (1981) found that teacher professional development had positive impact on teachers' effectiveness and change in classroom practices (cited by Liwewe, 1987; Desmone, 2009, p.181). However, Liwewe, (1987) reported that the positive impact was on the teachers themselves and not the students in the actual classrooms.

2.2.2 Teacher Professional Development in some countries in Europe

Menter et al. (2010) did studies in selected countries in Europe and found that teacher professional developments had a positive impact. This was,especially where the TCPD addressed teachers' needs (Menter et al, 2010). Kelly (2006) pointed out that TCPD activities needed to fit andragogy system of learning such as coaching, mentoring, modeling and giving feedback to the participating teachers in the TCPD.

Similarly, the Advisory Committee on Mathematics Education (2002) did studies in the United Kingdom and found a strong link between teacher professional development and students' high performance in Mathematics. The study further found that teacher professional developments had positive impact on changing classroom practices of teachers who held no-education qualifications. Villagas-Reimers (2003) argued that teachers who undergo professional development improve students understanding of the concepts better than those who did not attend on job training.

Villegas-Reimers (2003) argued that good teaching methods have a significant positive impact on how and what students learn and has a bearing on how learners achieve the goals. It showed that teacher CPD has a positive impact on teachers as agents of change in the society. According to the studies by Avalos and Haddad (1981), in India, Thailand and Philippines, teacher training was found to be very important in that it increased their expertise in their subjects and hence it had positive impacts on the learner achievement (cited by Liwewe, 1987).

2.2.3 Teacher Continued Professional Development in some African countries

The study by Steyn (2011), in the Republic of South Africa, found that teachers keep abreast of new knowledge and skills to reverse low student performance in class. Like in the USA, Steyn, (2011) found that investing in teacher development had more positive results than investing in physical resources according to Rodrigues-Compos et al. (2005) cited by Steyn (2011).

Another study by Pandey (2010) found that teacher CPD in the rural areas of Mpumalanga had positive impact on the quality of education. Pandey argued that "Good education demands good teachers" (pp. 17-20). He clearly pointed out that those good teachers are the ones that have not stagnated in growth and development. Teachers were able to use their new knowledge in and out of the classrooms situation. Hence, students got direct benefit from teacher CPD in rural areas of Mpumalanga in South Africa.

In Uganda, Nakabugo et al. (2011) conducted a study which revealed that in the Sub-Saharan Africa there is little emphasis on teachers continued professional development as a main component of secondary education. However, Nakabugo's study showed that it is secondary education that provided the society with the human capital needed for the national development. This study slightly differed with the studies in the other parts of the world by showing that teacher CPD should concentrate on content knowledge while other studies showed that resource management at secondary school weighs more than content knowledge for teachers. For example, Nakabugo et al. (2011) say, because of the level and complexity of the material to be taught, preparation of secondary teachers involves a greater emphasis on the subject content than at primary level (Mulkeen et al., 2007). Yet teachers express a strong desire for more professional support in general; better teaching and learning resources, supportive supervision, and ongoing in-service professional development.

In-service professional development for secondary teachers is a very promising area of policy and program intervention in improving the recruitment, retention, and retraining of secondary teachers (Mulkeen et al., 2007 cited in Nakabugo et al., 2011; see also Kunje et al., 2003 on the issue of a good teacher). This study further point out that teacher CPD is needed among those teachers who are qualified and more especially those who are not dully qualified to teach at a particular level.

In Zimbabwe, recruiting unprofessionally qualified and under-qualified personnel is not a new phenomenon. It is an international trend aimed at mitigating teacher shortages in schools, especially in rural areas (Mukeredzi, 2013). The study in Zimbabwe by Mukeredzi (2013) further explained that poorly educated teachers produce poor students and thereby indicating poor quality of education being offered to students.

In Kenya, Bunyi et al. (2011) stated that the Kenyan government saw the importance of teacher CPD right from the time of independence though little attention had been given to key curriculum areas. It was argued, in that country reports, that CPD in Kenya greatly helped those teachers who were either trained or untrained to attain a teaching qualification. Some of the untrained teachers employed due to the increased enrollments of pupils after introducing the Free Primary Education (FPE) policy, were enrolled in a two-year upgrading programme so that they qualify to teach (Bunyi et al, 2011). So, in-service programs in Kenya born positive results and got established at district and zonal levels. However, some studies found that Biology teacher had difficulties implementing the knowledge and skills gained from SMASSE trainings since its inception (Odawa et al., 2014).

In Tanzania, the country report indicate that in the 1970s about 10,000 teachers from primary schools were enhanced through professional development in an effort to improve the quality of education (Bhalalusesa et al., 2011). Overall, the Tanzanian government recognized that teacher training has a positive impact by enhancing the teacher's expertise (Bhalalusesa et al., 2011).

In Malawi, Zambia and Kenya, teachers are viewed as people who model and shape students in the school (Banda, n.d). In his study done in Malawi, Zambia and Kenya, Banda (n.d) found that these three countries attach great importance to teacher CPD which are implemented through in-service trainings (INSETs) largely because CPDs bring about the change In a teacher in teaching and learning strategies. Teachers who do not implement what has been taught to them caused pain to the whole ministry as Fullan, (1991) said:

> *Nothing has promised so much and has been so frustrating wasteful as the thousands of workshops and conferences that lead to no significant change in practice when teachers return to their classrooms. Neither participants nor workshops leaders are satisfied with the results of their efforts." (*as cited in Banda, n.d, p.1).

The quotation above shows that some teachers do not implement what has been taught to them while those that implement the knowledge and skills gained tend to improve the quality of education. For example, teachers are able to connect the new teaching and learning strategy to the general pedagogy and its context rather than being confused to select which one is better (Banda, n.d).

2.2.4 Teacher Continued Professional Development in Malawi

The concept of CPD in Malawi is not a new phenomenon among the mainstream ministries such as education. Kunje et al. (2003) identified documented teacher professional developments such as Multi-Site Teacher Education Research Project (MUSTER) that explored the Malawi Integrated In-Service Teacher Education Programme (MIITEP). It was a good project but lacked in most supervision, funding to source materials and delineation of JCE and MSCE holders for the training. It lacked needs assessment. The World Data on Education for Malawi (2010/11) showed that there were about 67% of unqualified teachers in all the secondary schools in Malawi as of 2007 who needed training or upgrading.

The GoM responded by introducing two important programs to upgrade unqualified and under qualified teachers at primary school level, namely: the Primary Teacher Development Program (PTDP) and the Malawi Integrated In-Service Teacher Education Program MIITEP (World Data on Education for Malawi, 2010/11). Agreeing with Mukeredzi (2013), Kunje et al. (2003) observed that in the primary school sub-sector there were many unqualified teachers who could benefit from CPD programs such as MIITEP. However, Kunje et al. (2003) found that under-qualified teachers bring with them to the CPD their skills, experiences and perspectives different from those that come direct from colleges and universities.

MIITEP expected that experienced and qualified teachers and head-teachers had the responsibility of assisting those under-qualified teachers. This proved difficult to do as there was no cooperation between the qualified and unqualified teachers. Consequently, the expected outcomes of that program were unsatisfactory because teachers were not adequately trained.

In her study, Selemani-Meke (2013) found that CPDs are very important as they bring about teacher motivation which play a critical role on their effectiveness to implement new skills. It is noted in that study that motivation and job satisfaction are both low in Malawi primary and secondary schools. Overall, Selemani-Meke's study found that teachers are not motivated based on the following findings in Zomba rural: little allowances, inadequate welfare, poor working conditions and low salaries hence this impede the implementation of what they learn from teacher CPDs. It was because of lack of job satisfaction that teachers did not implement the new skills and knowledge acquired from teacher CPDs in Zomba rural.

The review of literature has shown that teacher professional developments have positive impact on students as a result of teachers' change in classroom practices. The new skills that teachers gain from trainings enable them deliver their lessons effectively. However, other studies have shown that the positive change is significant on teachers themselves but little to the students. This occurred where teachers did not cling to the new concepts learned from the trainings.

2.5 Strategies used by teachers to teach Science

The choice of what teaching strategy a teacher uses for instruction is influenced by the need to actively engage the student in the learning process (Shindell, 2011). The strategy a teacher uses is aimed at inviting the learner to an active learning process in which the students themselves take a role in retaining the basic information and retrieval of the information at the later time. Shindell (2011) found that active learning methods are superior to retention of knowledge and retrieval. Hence, it can be argued that to improve students' learning, teachers need to use suitable methods.

Science and Mathematics can be taught using many pedagogical skills as long as those skills and existing strategies relate very well with the goal of learning. One such strategy of teaching science is through scientific inquiry (Gyllenpalm, 2010; Anderson, 2002). Scientific inquiry has become a guiding principle in policy documents, curriculum designing and development and even in syllabi worldwide (Gyllenpalm, 2010, Malawi Senior Secondary Teaching Syllabus, Biology, 2001; Malawi Senior Secondary Teaching Syllabus, Geography, 2001; Malawi Senior Secondary Teaching Syllabus, English, 2001).

Scientific inquiry is described as a systematic approach used by scientists in an effort to answer their own questions (or hypotheses) of interest (Laderman, 2004 cited in Gyllenpalm, 2010). Inquiry is understood in two ways: as a content to be taught and a pedagogical strategy of teaching science subjects. As a pedagogical strategy, it refers to the idea that students should learn science by conducting research in order to gain scientific knowledge. As content, it refers to conceptualization of the whole curriculum and arrangement of the material to be learnt by students. This, in essence, helps learners to make hypotheses and verify them at the end of their research. Furthermore, the inquiry enables learners to develop critical thinking and sharpen their reasoning abilities.

Dzama (2006) noted that teaching science meets a number of challenges such as the students' perception of science as a subject, science learning and their own perception of themselves. For example, students in Community Day Secondary Schools (CDSS) perceives themselves as less advantaged compared with those in Convectional

Secondary Schools (CSS). He further pointed out that these factors affect students in their endeavor with science subjects as these factors relate to their self-efficacy. In addition, he argued that the teaching strategy used by the teacher in the teaching and learning process of science subjects enable students to acquire or fail to acquire the intended knowledge and this enhances learners' mental competence. This meant that teacher centred strategies which teachers used before SMASSE training failed the students to acquire the knowledge in class. Both Gyllenpalm (2010) and Dzama (2006) agreed that whatever strategy and content a teacher uses, the new knowledge will be acquired based on the previous knowledge of the individual learners. Dzama (2006) argued that if the student has a poor science or mathematics background at primary school level, the subsequent levels of that student will be affected by the poor background encountered at primary school (see also Inyega, 2005).

Neranjani (2011) expanded the notion raised by Dzama (2006) about students' perception as a factor making the teaching and learning of science and mathematics a success or failure in schools . She argued that a student learns better when s/he perceives that the efforts put forward will be rewarded and that the environment of the teaching and learning process is physically and emotionally safe. Safe environments for science subjects encourage learners to acquire knowledge using the different learning styles that teachers employ in their classrooms. She, however, bemoans that there is less research on teaching styles (skills or strategies) as compared with learning strategies (SMASSE 2010). She noted that most teachers teach the way they learnt and choose that practice that worked best for them (Stitt-Gohdes, 2001 cited in Neranjani, 2011).

Inyega, (2005) further pointed out that teachers' cultural background and daily experiences at home affect how they teach their subjects in the classroom. He also showed that the context in which these teachers live in and work in affect their way of teaching the subjects. For instance, a society that has less liking for schooling or low preferences for mathematics and science subjects would definitely affect negatively the teachers' efforts. Thus, teachers' daily experiences in their practice context shape their understandings and their understandings shape their experiences (Kimberley, 2008).

SMASSE insets trains teachers using the ASEI/PDSI concept which is a hands-on emanated from the constructivism learning theory. Participating teachers are drilled that students need to learn through inquiry and actually doing the activities in order to acquire knowledge (MacCarthy, 2015). SMASSE promote and encourage the teachers to impart knowledge to their learners using the hands-on approaches. This thesis investigated the utilization of teaching strategies of teachers after being trained by SMASSE for some years now.

Neranjani (2011) suggested that an effective teacher should combine all learning styles in the teaching and learning process in order to reach out to all students in the classroom, such as auditory learners, visual learners and kinesthetic learners. She observed that auditory students learn by hearing and use their ears to acquire knowledge, visual students learn through seeing while kinesthetic students learn when their bodies move about. Sjoberg (2000) also argued that for science and mathematics to be taught and learnt successfully, there should be change in the pedagogical skills used to deliver the content to students. Teachers who do not vary their pedagogies fail to assist every learner in their class. Varied teaching skills respond to the needs of learners.

Overall, the literature above has shown that science education is very important for any nation. Education develop the potentials of the students as the country's future human capital. Thus, various interventions in education aim at offering the student the best way to learn and acquire the skills to survive and contribute to national development. Through such potentials, the youth will contribute to the socio-economic development of a country. Teachers help prepare the students in developing their potentials, the country's human capital. Teacher professional developments enable teachers change positively in their classroom practices as they develop the youths through offering quality education.

2.6 Conceptual Framework

This thesis used the SMASSE concept of student activities, student centred pedagogies, student experimentation and improvisation (ASEI/PDSI) of teaching and learning resources. Participating teachers were drilled in teaching pedagogies that greatly engaged the students in a constructivist way. Taber (2011) pointed out that constructivism is a major referent theory in science education. Constructivism as an educational theory comprise ideas of how students learning occurs, the factors that tend to channel learning; the ideas about how the curriculum and instruction should be designed to best respond to educational purposes, given what is understood about learning (Taber, 2011).

Dzama (2006) claimed that constructivism theory is widely accepted in education and knowledge acquisition which promotes learner-centred instruction in a classroom situation. Therefore, the ASEI/PDSI concept that SMASSE uses is grounded in the constructivism learning theory and puts much emphasis on students' centred pedagogies. This ASEI/PDSI concept of learning departs from the traditional teacher centredness to learner centredness with a deep understanding that learners are not tabula rasa (blank slates) but that they need active involvement to reconstruct what they know to interpret their world (Taber, 2011).

The major challenge with the teacher centred approach is that communication of the intended knowledge is either successful or fails as the diagram below shows:

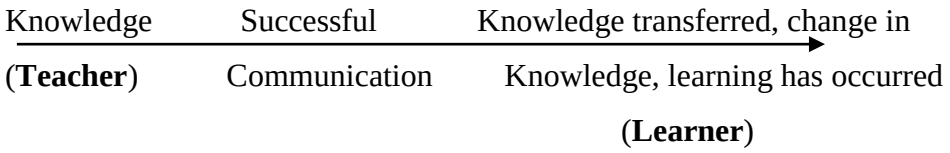

Figure 1: Showing Communication Channel

Illustration adopted from Taber (2011)

This illustration shows that learning has occurred because there was a successful communication from the teacher to the learner. However, knowing that children interpret their worlds differently, communication may fail as the following diagram illustrates:

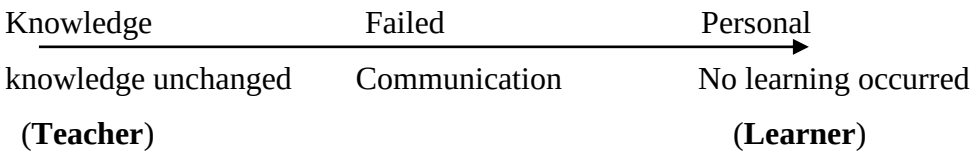

Figure 2: Showing Communication Channel

Illustration adopted from Taber (2011)

Taber (2011) argued that in traditional approaches, some knowledge is copied from the teacher onto the mind of the learner but ASEI/PDSI engages the learner to socially construct meaningful interpretation of what is being seen, heard or done by doing the activities (p.40).

2.7 Chapter summary

The purpose of this research was to investigate the extent to which Community Day Secondary School (CDSS) mathematics and science teachers' utilization of the pedagogical knowledge impacted the youth policy in Malawi. The literature has explained the relationship between the youth policies and education. It has further explained the link between teachers' classroom practices and their professional developments. Teachers gained in-depth understanding of new concepts through interactions during professional developments which improve their lesson deliveries. The reviewed literature has shown that teachers change their classroom practices through professional development. The next chapter discusses research methodology.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This study aimed at finding out what CDSS teachers in Balaka have learned from SMASSE trainings and how they utilize the pedagogical knowledge and skills acquired in their classrooms. In order to achieve the study's purpose logically, there was need for a research methodology. This chapter, therefore, discusses the research design, sampling procedures and data collection instruments that were used. It further describes the study area and the data analysis procedures that were used.

The mixed research design was used to guide this study. Mixed research design is a study that involves collecting and analyzing both quantitative and qualitative data in a single study (Creswell, 2003). As it uses both sets of data, it is also called Multi-method Matrix by Campbell and Fiske who pioneered this research design. Ary et al. (2010) pointed out five purposes for conducting a mixed research. These purposes are described as follows:

a. Triangulation: seeks to examine the convergence of evidence from different methods that study the same phenomenon and collaborates findings from one method (Creswell, 2003 citing Jick, 1979).
b. Complementarity: seeks the elaboration, illustration, enhancement and classification of findings from one method using results from the other.
c. Development: uses results from one approach to inform the other approach. That is, one can begin with qualitative and end with the quantitative (sequential exploratory) or start with quantitative and finish with qualitative methods (sequential explanatory) (Creswell, 2003).
d. Initiation: discovers the paradoxes or contradictions in the findings in order to reframe a theory. So, it is used to add scope of the inquiry.

3.2 Research Design

For this study to ably pursue the research problem and answer the research questions, it employed the mixed research design emphasizing on sequential exploration. A sequential exploration can begin with qualitative and end with the quantitative (sequential exploratory) or start with quantitative and finish with qualitative data (sequential explanatory) (Creswell, 2003; Ogbonnaya, 2011citing Creswell, 2008). The mixed research design was chosen because each of the quantitative or qualitative research has limitations. Therefore, by combining the two in one study cancels the weaknesses of each individual method (Creswell, 2003). The use of quantitative data helped to generate findings that were generalizable while the qualitative data helped in understanding the lived experience and pick out feelings of the participants expressed in words which could not be expressed in numbers. Qualitative data helped to get the deeper understanding of the phenomenon which could not be understood by reducing the data to numbers. So, this study used the mixed design to explore and understand more about the pedagogical knowledge, skills and extent to which these are utilized in all the CDSSs in Balaka district (Chatambalala, 2011).

As stated earlier on, a mixed research design uses both quantitative and qualitative sources in order to collect data. Therefore, this study used individual interviews, lesson observation and document analysis to collect the data because these instruments have proved to be successful in many studies (Chatambalala, 2011).

3.2.1 Study Area – Balaka District

Balaka was chosen as a study area because of convenience. It was because the researcher was based in Balaka at the time the data were being collected. Hence, travelling within the district caused minimal challenges. According to Nampota and Selemani-Meke (2014) and MANEB Reports, CDSSs are the schools where performance in mathematics and science related subjects is very poor (JCE and MSCE MANEB Chief Examiner's Reports, 2006, 2007, 2011 and 2012). The poor results in national examinations, therefore, indicate that students are not doing very well in Balaka district. However, research indicates that poor quality education reflects the effectiveness of the teacher as argued earlier in this thesis.

3.3 Sample Size and Sampling Techniques

The study intended to gather data from the mathematics and science teachers who have been impacted by SMASSE mandatory training at least once. This study randomly selected mathematics, biology and physical science teachers who have ever attended SMASSE training at least once in their teaching profession.

The total number of mathematics and science teachers who have attended SMASSE trainings in Balaka district more or one time were 93. Thirty two were biology teachers, twenty for physical science and thirty seven were for mathematics. Four teachers were doubling mathematics and physical science at that time. Of the ninety three (93), 32 teachers were MSCE holders, 28 diploma holders while 16 were degree holders. Eighty were males while thirteen were lady teachers. Of the thirty three Biology teachers, four had degrees; twelve had diplomas while the other twelve had MSCE. Eight mathematics teachers had degrees, eleven had diplomas and thirteen had MSCE. Of the twenty Physical Science teachers, four had degrees, five possessed diplomas and seven were MSCE holders. It was noted that those with degrees were mostly teaching at least two science subjects which made it difficult to categorize them into subject areas.

With regard to the above characteristics of teachers, it was noted that teachers with degrees were seventeen percent (17%), those with diploma constituted thirty one percent (31%) while MSCE holders made thirty five percent (35%). It was also noted that MSCE teachers were under qualified to teach at secondary school while some degree and diploma holders were teaching subjects they are not qualified in. For instance, a Geography major teaching Biology. This further made it difficult to categorize the teachers in their subject areas.

In terms of length of teaching service, two teachers had taught less than three years, five taught between three to five years. Four teachers had taught between five and ten years while five teachers had taught science subjects more than ten years. All these teachers had attended SMASSE more than once.

In order to come up with the sample size, the researcher assigned numbers to all the teachers constituting the study population. The assignment of the numbers gave each teacher an equal chance of being picked thereby minimizing the bias. Then, a sample of seventeen percent (16 teachers) was found by calculating the K^{th} element to randomly select the sample (Ary et al., 2010). Seventeen percent was deemed representative for this study (Ary et al., 2010). The sample, therefore, consisted of six head teachers, 13 heads of science department and 16 teachers for mathematics, biology and physical science in all the CDSSs in Balaka district.

It should be noted here that of the sixteen teachers some doubled their roles as head teachers, some were head of the science departments and others were also teaching more than one science subject. Such teachers opted to participate in one role only that is as a science teacher.

3.4 Data Collection Techniques

According to Creswell (2003), mixed research design uses data collection methods based on the pragmatic knowledge claims which gather both quantitative and qualitative data. This sequential collection of data enables the process to collect diverse types of data that best provide an understanding of a research problem.

In order to investigate the extent to which teachers utilize the pedagogical skills learned from SMASSE trainings, this study was guided by the SMASSE conceptual framework of ASEI/PDSI which is used in selecting data collection instruments. Since this study used mixed research design, the data collection instruments combined quantitative and qualitative techniques such as lesson observations and individual interviews (Ary et al., 2010). In addition, there was an analysis of school documents such as schemes and records of work, lesson plans, tests and assessments given by mathematics and science teachers in their classes. Observations helped to collect the data quantitatively whereas interviews gathered the qualitative data.

3.4.1 Classroom Observation

Classroom observation was the instrument used to collect quantitative data. This study borrowed the SMASSE checklist used to observe and evaluate the lessons. So, the instrument for classroom observation was already there made by SMASSE Malawi. Observation is defined as the instrument used to collect data by involving our sensory systems such as the eyes and ears to record behavior (Kawulich, 2005). It was chosen because it is known as the basic tool for data collection in quantitative research (Ary et al., 2010).

Observation is very useful when a researcher is interested in making judgment about the naturally occurring behavior and its frequency. It is a hallmark instrument in education, sociological and anthropological studies (Kawulich, 2005). It permits collection of data where and when the activity is occurring. The researcher is able to see what participants do rather than relying on what they say they do.

However, some shortfalls of observation technique are that it is susceptible to bias of the researcher. It is also affected by Hawthorne effect- that is participants usually perform better when they are under observation. The researcher also had difficulties checking and ticking the categories while the lesson was going on.

To minimize the weaknesses of this, the researcher also used interviews so that the categories missed during the ticking of the checklist could be clarified by the respondents. By using the interviews and the lesson observation, the paper controlled bias that may come from one instrument as stated above. In addition, the selection of participants was purposive in that only teachers who were conversant with science subjects were observed (Bernard, 1994). Bernard argued that competent participants minimize the biases of a researcher. Based on the argument above, this researcher observed lessons in the actual classrooms to collect the data. Each teacher was observed once and the researcher assumed the role of a participant observer as the data were being collected. In the course of observing the lessons, the researcher was collecting data on ASEI/PDSI pedagogies that SMASSE has drilled all the teachers participating in SMASSE Malawi trainings.

3.4.2 Individual Interviews

The second instrument used to collect qualitative data was individual interviews. Ary et al. (2010) stated that interview was one tool of collecting qualitative data as it is used to gather people's opinions, beliefs and feelings about a phenomenon such as SMASSE training. An interview is a conversation whose purpose is to gather descriptions of the life world of the participant with respect to interpretation of the meaning of the described phenomena (Alshenqeeti, 2014). Interview was chosen because it allowed respondents to describe what is important to them while enabling the researcher to gain in-depth knowledge. The researcher can gather direct quotes and stories from the participants. However, interviews are susceptible to bias. It is time consuming and expensive to conduct. However, Alshenqeeti (2014) argued that the reliability and validity of this instrument is maintained when researchers do not ask leading questions, should take notes and do not rely on recorders only and ask participants to sum up the main points they described in the interview process.

This current study, therefore, utilized the unstructured interview which took the form of natural conversation in that questions arose from the situation (Ary et al., 2010). These authors called this type of interview a conversation with a purpose. Individual participants were asked questions in order to gather information about what the impact of SMASSE training is and the problems associated with the implementation of what SMASSE has imparted to them. Each participant was interviewed once so that the participants could provide data about the ASEI/PDSI approaches that SMASSE Malawi drilled them (See Appendix on page 68-69). In order to maintain confidentiality the teachers were coded by numbers one to sixteen.

3.4.3 Document Analysis

Lastly, various documents such as evidence forms for inspections, JCE and MSCE pass lists from 2005 to 2013, schemes and records of work, lesson plans, period registers and end of term tests' results were studied rigorously. These documents were studied in order to find the aspects of ASEI/PDSI. For instance, to check the ASEI lesson plans, school pass rates to assess students' performance in national and end of term examinations. Finally, the documents provided evidence that teachers were attending to students and planned their work adequately. This was done to compliment the data gathered through interviews and observations.

3.5 Ethical considerations

Before the researcher went to access the participants in various CDSSs, he was given an introduction letter from the supervisor to the Education Division Manager (EDM) (see Appendix on page 68). The EDM then authorized the researcher through his letter to all head teachers in all the CDSSs in Balaka district informing them about this research. This researcher, therefore, adhered to all the ethical considerations when carrying out this data collection exercise. As Ary et al. (2010) explained, a good rapport with the participants was set to avoid ill-treating them during data gathering.

Selemani-Meke (2013) argued that it was proper to abide by ethical considerations so as to ensure that individual rights were not infringed upon and to promote fairness in the interpretation of data. Principles such as obtaining informed consent; respecting the right to privacy and participation, anonymity, confidentiality, avoiding harm to participants, and other principles as highlighted by Cohen et al. (2000) were adhered to during the data collection process, data analysis and interpretation (cited by Selemani-Meke, 2013). In view of the above considerations, head teachers and participating teachers were informed, well in advance, about the researcher's visit at their respective CDSS and the purpose of the study. Through the head teachers, the researcher and the teachers arranged the date when the data were to be collected. They were never forced to participate in the study. Fortunately, the moment the researcher introduced the topic of his study, many teachers showed great interest to participate, an opportunity this researcher seized and adequately utilized. They were assured, before data collection started, that their information would be treated with utmost

confidentiality and anonymity because the information was specifically for academic purposes. At the end of each session observation or individual interviews, each participant was thanked and respected but none of them were given money or anything as a token of appreciation. The researcher had close contacts with most of the CDSSs teachers which helped to collect the data because the more the visits were made to the participants, the more normal behavior they showed. Hence, the data collected were reliable (Pandey, 2010).

3.6 Data Analysis Procedure

For this study to answer the research questions, it used both the quantitative and qualitative analyses procedures. Data analysis is the most complex, difficult and mysterious stage in a mixed research because the researcher has volumes of field notes, interview transcripts, recordings and reflections and the information from the documents all these need to be examined and interpreted (Ary et al., 2010).

Authors have pointed out that data analysis in qualitative research is not linear as in quantitative research but is done simultaneously with data collection through iterative, cursive and dynamic process in mixed research (Ary et al., 2010). So, data collection, analysis and report writing did not occur in distinct stages. The quantitative data which were collected through the classroom observations were analyzed using Microsoft Excel. Microsoft Excel was used to create frequency distributions and graphs as explained by Chatambalala (2011).

For the qualitative data, the analysis procedures involved organizing and coding of the data. Creswell (2007) explained that upon collecting the data, they must be organized and managed (cited by Ary et al., 2010). He argued that the researcher ought to engage the data through reading and rereading and reflecting and then describe, classify and interpret them (cited in Ary et al., 2010). He called that whole process Data Analysis Spiral which fits many types of qualitative research designs (cited in Ary et al., 2010). Ary et al. (2010) however, put the whole process of analyzing data into three broad groups namely: familiarizing and organization, coding and reducing and interpreting and representing. These groups are described below.

Familiarizing was done through careful and frequent reading and rereading, viewing and reviewing videotapes, listening to audio recordings so that the researcher gets to know his/her data. This is done with the aim of easing the process of transcribing of all the data. Words and phrases are transcribed directly without corrections to improve the grammar of the respondent because that correction creates bias when summarizing the responses. The data are then organized in a variety of ways such as by list of interviews, questions, people or places. Data are easily stored when properly organized. One has to make photocopy of the original version so that working must be on the photocopied material while securing the original copy for references (Ary et al., 2010). Coding and reducing the data is the very core of any qualitative data analysis (Ary et al., 2010). It is the process of coming up with concepts from the raw data collected. The researcher identified the categories and themes while refining them where necessary. In axial coding, the researcher read and reread the data to identify units of meaning-words, phrases, sentences, and subject's line of thinking and behavior patterns which are regular and important to the research topic. Those units are labeled (coded).

By using the ASEI/PDSI conceptual framework, the codes were lifted from the following concepts: student activities, student centred pedagogies, student experimentation, improvisation of teaching and learning resources, planning of work, doing the work, seeing (evaluation) and improving the work where necessary. These were the codes taken from SMASSE Malawi checklist. The codes which appear frequently signify the importance of that code or category. The researcher had to put similar codes together to create categories which were narrowed down to themes. This is what is called data reducing as the following figure shows:

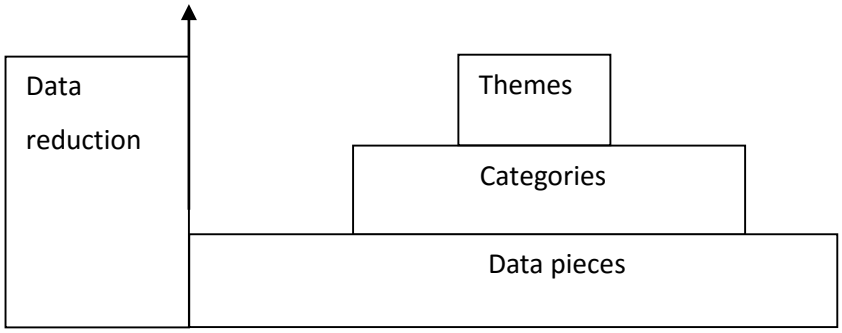

Figure 3: Showing Data Reduction

Source: Ary et al., (2010) Data Pyramid with alterations

Data interpretation entails bringing out the meaning, telling the story, giving an explanation and developing plausible explanations from the data collected (Ary et al., 2010, p.490). It is rooted in the reflection of the words and acts of the study participants and abstracting the important understanding from the collected data. The quality of interpretation depends on the background, perspective, knowledge and the theoretical orientation of the researcher (Ary et al., 2010). There are no statistical tests of significance to facilitate interpretation of qualitative data. Qualitative research confirms what we already know as supported by data and illuminate what was not known but should have been known (Ary et al., 2010). Maxwell (2005) argued that "Experienced researchers begin data analysis immediately after finishing the first interview or observation and continues to analyze data as long as s/he is working on the research and stops briefly to write…" (Cited by Ary et al., 2010).

Based on the above explanation of data analysis, this researcher collected the data and coded them into categories. The categories were linked depending on their similarity to create themes which were already pre-set because the study was about SMASSE's ASEI/PDSI which were the themes themselves. This researcher, therefore, used pre-set codes under the abbreviation ASEI/PDSI.

3.7 Limitations of the Study

Limitations are defined as influences that the researcher cannot control (www.bcps.org). They are the shortcomings, conditions or influences or restrictions of a research work (www.bcps.org). According to Kombo and Tromp (2006) limitations are all the challenges anticipated by the researcher as far as the data collection is concerned (cited by Irunga & Mugambi, 2013):

1. The research findings of this study are only generalizeable to schools with similar characteristics because it used a mixed research design. However, visiting all the CDSSs in Balaka helped gather as much data as it was possible thereby ensuring the study's reliability and validity (Pandey, 2010).
2. The results were also affected by the holiday time in the school calendar such that some participants were not at the school. The researcher tried his best to

analyze the documents such as lesson plans, schemes and records of work and MANEB's results so that these documents can reflect the teacher's effectiveness in class. This effort again helped increase the reliability and validity of this thesis.

3. Financial resources were insufficient to expand the size of the study area so that a broader picture can be captured but the researcher strived to reach the entire mathematics and science teacher trained under SMASSE in all the CDSSs in Balaka district.

3.8 Chapter Summary

This chapter has described the mixed research design and explained the data collection tools that were used. It has further discussed the sampling procedures which were used to arrive at the sample size. It has also explained data analysis procedures. The next chapter is on research findings.

CHAPTER FOUR

FINDINGS AND DISCUSSION

4.1 Introduction

The study investigated the impact of utilizing the student centred pedagogies in class in developing the potentials of students. This chapter, therefore, presents and discusses the research findings using both quantitative and qualitative techniques because the research design was a mixed research. The study was done in thirteen community day secondary schools (CDSSs) in Balaka district of South East Education Division (SEED). The sample size comprised sixteen teachers: head teachers, heads of the science department and science teachers in general. The results in this study have been categorized into three themes. The first theme was pedagogical knowledge which was further divided into knowledge of the subject matter and pedagogical skills; the second was the utilization of the pedagogical skills in the classrooms and the third one was challenges encountered by science teachers in implementing the pedagogical skills in class. These themes gave a true reflection of the research questions and were based on participants' responses. Tables and graphs have been used to present summaries of these findings.

4.1.1 Knowledge and skills gained from SMASSE trainings

4.1.2 Content knowledge

The first research question of this study was to investigate if the teachers had gained any knowledge from the SMASSE trainings. The results from interviews, lesson observations and SMASSE documents showed that the participants had learned content for many challenging topics during trainings. The topics from individual subjects were covered upon agreement between participating teachers and their facilitators in their respective subjects, before the closure of the trainings. In Physical Science, teachers reported to have learned topics such as Properties of matter, Nuclear Physics, Chemical Reaction II, Acids and Bases and Electricity and Magnetism. A participant from CDSS 6 pointed out that he benefited a lot in physical science.
He said:

> *Twenty years experience! You know I have been teaching for so long with MSCE certificate but I tell you, the topics and their methods that we were taught from 2005 to date have given me wider understanding of the topics and the skills of teaching them. Most of those topics come during JCE and MSCE examinations* (interview with participant 8 on 11/03/14)

A participant from CDSS 13 argued that there was no topic in the physical science syllabus that he could not teach. He said, *"SMASSE taught me how to teach nuclear physics, electricity and chemical reaction II and the skills of teaching such topics."* This was in contrast with sentiments of a mathematics teacher from CDSS 10 who said, *"SMASSE is good but suitable for MSCE and Diploma holders not for me. I did these things while at college and I [am] repeating them now."*

In mathematics, teachers reported that they gained content knowledge in the following topics: Trigonometrics, Transformation, Linear Programming, Surds [Irrational Numbers], Vectors and Probability. One mathematics participant said, *"Among the many topics I have learned at SMASSE is Transformation and Reflection. Although the facilitator presented it haphazardly but I got something there"* (interview with participant 15 on 10/03/14). This means that the participant grasped the new knowledge gained from the training.

Just like their counterparts, Biology teachers mostly reported that they covered topics such as Tropisms, Coordination, Genetics [Reproduction], Investigative skills, microorganisms, Ecosystem and Evolution. One biology participant said, *"Before I started attending this training, I did not teach Evolution or Genetics with confidence but I am better off now."*

Interviews with heads of the science department and head teachers revealed that teachers had indeed improved the mastery of content knowledge. In addition to gaining content knowledge, the participants also reported to have learned pedagogical knowledge in topics that are regarded as difficult to teach.

4.1.3 Pedagogical knowledge

In addition to the subject matter of the topics, teachers were also trained in ASEI/PDSI pedagogies. Table 3 summarizes the findings in terms of the ASEI pedagogies:

Table 2: ASEI Pedagogies used by teachers drilled by SMASSE Malawi

	Activities	**Pedagogy**	**Experiment**
T1, T3 T8	Exercises, plotting graphs and assignments	Involving students, efficient use of teaching aids, improvisation	Not done in maths
T2 T9	Remedial, extra class, sourcing aids, procedures	Hands on, minds on, eyes on, groups	Few in large class,
T10 T11	Tasks, consolidating activities, remedial classes	Content, confidence, groups, active participation, pairs, vary methods, ASEI lesson plans, improvisation	Depends on topic, resources
T4 T16	Problem solving activities, meaningful, explain their view point	Validate methods, discovery method, engage learners, improvisation	Exercises in maths

T5 **T6** **T7**	Learners designing models, think outside the box, practical work given, exercises given	Simplify methods, extra knowledge, repeat the lessons, brainstorm, storytelling, role playing, discussions, improvisation, lesson plans	Time factor, overloads, large in large class it's not done
T13	Included 80% of activities,	Better methods e.g. improvisation	Incorporated
T12 **T14** **T15**	practical work, summarizing the lessons, home works, exercises, individual work	Brainstorm, improvisation	Were included

Table 2 shows teachers' mastery of the ASEI pedagogical methods. Each topic discussed at SMSSE was covered simultaneously with the suitable teaching skills for that content. It can be observed in the table that seven teachers used class exercises as a way of incorporating students' activities (A) in their lessons. Homework was cited as another way of giving students activities that can be done at home.

Many teachers in all the science subjects reported the use of group works as a way of achieving student activities in their lessons. Groups were said to suit large classes as long as teachers tell the students in advance the significance of this teaching skill. One participant said*, "Students activities are not easy with big classes. You can't reach every pupil. So, work [given] in pairs or may be five members help me engage them than individual work."* The table further shows that two teachers reported that they incorporate demonstration, extra (remedial) class, practical work and lesson evaluation as the activity students should do in the course of the teaching and learning process. One teacher said, *"Student activities help to capture and maintain their curiosity in the teaching and learning process"* (interview with participant 1 on 14/02/14). Another one said, *"Even question and answer can be an activity as long as the teacher asks exploring questions to the students"* (interview with participant 2 on 14/02/14).

On experimentation (E), teachers reported that experiments were done in Physical Science and Biology. Although most schools visited did not have up to date laboratories, teachers did experiments. One participant said that iodine was available for testing for starch, but many chemicals needed in Biology were not there. Similarly, a Physical Science teacher reported that cells, connecting wires, ammeters and voltmeters were there at his school and they were used for experiments in electricity. He said, *"I use the cells and the connecting wires when teaching the topic of electricity but sometimes I fail to find chemicals for other topics"* (interview with participant 6 on 06/03/14)

In terms of ASEI pedagogical skills, teachers showed that they gained a lot of teaching and learning skills which are learner centred methods. These were student activities (A), student centred pedagogies (S), experimentation (E) and improvisation (I). Teachers reported that the methods were designed to suit both large and small classes in their schools. Most teachers cited the skill of improvisation (I) as a teaching skill gained from SMASSE Malawi.

Improvisation was the most cited pedagogical skills teachers internalized at SMASSE. Nine teachers (62.25%) reported that they had learned a new teaching skill at SMASSE called improvisation. A participant at CDSS 5 said, "*We have learned improvisation skill at SMASSE. We can turn plastic bottles into beakers in Physical science*" (interview with participant 8 on 10/03/14). This showed that teachers were utilizing some of the skills they gained from SMASSE training in order to engage the students in class.

The results showed that instead of relying on conventional materials, teachers and students can manipulate local materials to use in their lessons. A participant at CDSS 2 said, "*I improvise most teaching aids. I mix maize and bean seeds to teach about population in Biology*", (interview with participant 14 on 11/03/2014). This skill, however, was confused with TALULAR (teaching and learning using locally available resources). Most teachers were unable to differentiate these two terms. One teacher at CDSS 1 said, "*I learned TALULAR at Mzuni and I am learning the same skill at SMASSE though they call it improvisation*." It was also found that Biology and Mathematics teachers mentioned improvisation than those in Physical Science. They argued that chemicals cannot be improvised. One participant said, *"No improvisation in Physical Science because the chemicals need to be manufactured and bought. The containers can be made though."* This was, however, not true as there are some chemicals that could be obtained from local traders and local facilities. Three teachers (18.75%) explained that SMASSE taught them in small groups to discuss the topics. This meant that they learned about group works as a teaching skill more especially with large classes.

Three teachers (18.75%) reported to have learned a pedagogical skill known as hands-on activities. A participant at CDSS 11 said, "*We were taught at SMASSE to incorporate students' activities which are minds-on, hands-on, eyes-on and ears-on so that they use multiple organs when learning*" (interview with participant 16 on 10/03/2014). Similarly, at CDSS 10, a participant said, "*Activities are there to give students more talking time while the teacher is consolidating their viewpoints*." It can be speculated from the interviews and Table 3 above that teachers understand that students' activities are essential as long as they engage the students meaningfully in the teaching and learning process.

In large classes that were observed, teachers mostly utilized the pedagogical skill of groups such as pair works. Four participants pointed out that group works are best suited in large class. A participant at CDSS 13 said, "*The skill of group work is used mostly in large classes. A teacher is able to supervise the group works and reach as many students as possible*," (interview with participant 12 on14/02/2014). Similarly, participant 7 said, "*Group work such as pair work encourages students who are shy to speak amongst themselves and grasp the concept in the process*", (interview with Teacher 7 on14/02/2014). This showed that group works promote students' understanding as they talk to each other in the teaching and learning process. It also helps those students who are shy to answer questions in class and find assistance from their fellow students in the groups.

In terms of experimentation, teachers also showed that they learned the skill during the SMASSE trainings. Teachers in Biology and Physical Science explained that they do experiments depending on topics, time and availability of teaching and learning resources at their school. During interviews, it was revealed that their understanding of the experiment in the ASEI/PDSI concept meant the laid down experiment in the books. Most teachers did not understand that by experiments it also meant what a student does in the class or outside that shows s/he has learned something in class.
Mathematics teachers differed widely on aspect of experimentation. Participant 13 clearly said, "*There are no experiments in mathematics but in Biology and Physical Science or Agriculture*" (interview with participant 13 on11/02/2014) yet participant 11 said, "*Experiments are done in all the subjects especially mathematics but follow steps for procedures to arrive at an answer*" (interview with participant11 on14/02/2014). Participant 5 explained that by experiment it means what a student does during the lesson and what is done after class. He said, "*By experiment we mean what a student does during the lesson and what s/he can do outside the class that show that learning took place*" (interview with participant 5 on14/02/2014). The responses showed that some teachers have forgotten what they were taught in the early years of SMASSE Malawi.

The foregoing discussion shows that in terms of ASEI, the teacher interviewed gained knowledge on the pedagogical skills of incorporating activities (A) in the lesson (hands-on, minds on), including experimentation (E). They also learnt improvisation (I). What does not appear to come out very clearly from the teachers is the idea of student centredness (S), whereby the students are given opportunities to contribute their ideas in the lesson and develop their own understanding. Although group work is mentioned, this was not sufficiently explained to accommodate student centredness. However, the findings showed teachers' effort to impart scientific knowledge to students in developing the youth realize their potentials as the Malawi Youth Policy stipulated.

The research question further wanted to find out the pedagogical knowledge of teachers in the PDSI, especially planning of their work. Results showed that teachers drew schemes and filled the work done column which is evidence of reflection on the part of the teacher. Study of the documents showed that schemes were updated though few were not updated timely. It was found that teachers used lesson notes instead of lesson plans. They pointed out that with or without a lesson plan, the lesson notes are widely used at secondary school.

However, when it came to planning lessons, the findings show that only four teachers included lesson plans as part of the pedagogical skills SMASSE drilled them in. This represented 25% of teachers using lesson plans in their classrooms. The rest of the teachers used lesson notes in the teaching and learning process, representing 75% of the teachers. Participating teachers stated the reasons for not drawing lesson plans as follows: it is meant for primary school teachers, heavy workloads, time consuming and the lesson plan doesn't teach. Since some of the teachers were heads of the science department (HODs), it was found that only four of them drew and used lesson plans in class.

Interviews with those teachers that drew and used lesson plans showed that they were SMASSE trainers at the division level and they did it because they wanted to be exemplary to others. One HOD said, "*I drew the lesson plans because as a trainer I am tempted to be exemplary.*"

4.2 Utilization of the knowledge and skills gained by the teachers

The ASEI/PDSI conceptual framework emphasize that teachers need to utilize the pedagogical skills in the actual classrooms so that students benefit, especially by attaining the intended knowledge and skills. The second research question, therefore, sought to find out the extent to which the pedagogical knowledge gained from SMASSE is utilized in the actual classrooms. It further sought to find out the impact of utilizing the ASEI/PDSI concepts in developing the students' understanding of science subjects. In order to assess this, the SMASSE checklist was used in observing participants' lessons. The findings are presented using the ASEI/PDSI conceptual framework.

4.2.1 Incorporation of activities (A)

The findings of the lesson observations showed that almost all the teachers incorporated a certain amount of activities in their lessons. According to Kamoto (2017) teachers incorporate students' activities in order to engage them actively in the lesson. The activities needed to be hands-on, minds-on, interests-on, mouths-on so that students use multiple sense organs as they interact with the concepts. Such activities reflect a constructivism theory on which ASEI/PDSI is based. Both the ASEI and the constructivism theory promote student centred activities in the learning process.

Figure 4 below shows that almost all teachers utilized student activities in their lessons with teacher 7 utilizing the skill in all the lessons taught while teacher 16 used it in 80 percent of the lessons. Four out the sixteen teachers (25%), however, used it to a minimal extent.

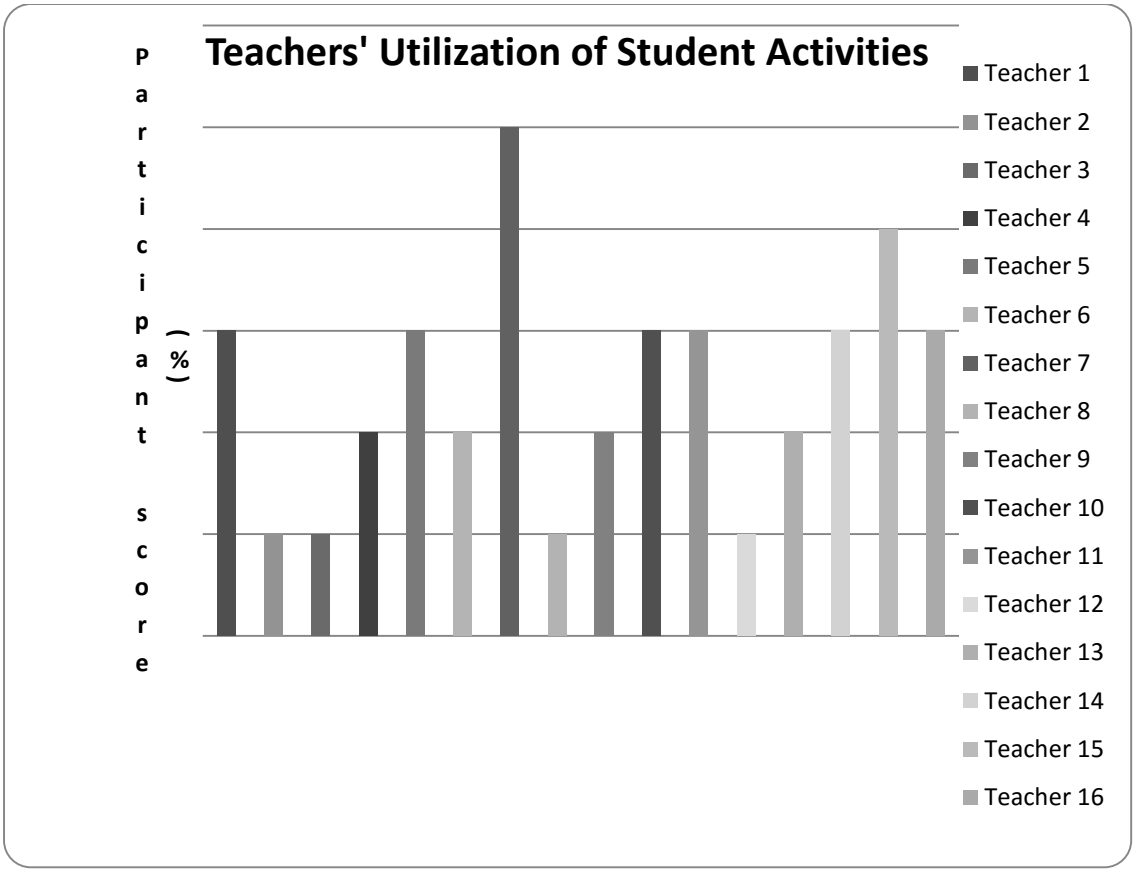

Figure 4: Teachers' utilization of Activities

The teachers that used the skills engaged students in the designed activities in order to promote active learning among the students thereby reflecting the intent of the youth policy which desired to mold the youths as future human capital. It was revealed, during interviews, that most of the teachers who involved the students meaningfully were from schools which have boarding facilities and do withdraw students who perform poorly in class.

One participant from such schools said, "*This school is not a CDSS because the Church does not allow laziness among our students"* (interview with participant 2 on14/02/2014). Most teachers had activities based on the specific objectives but were unable to engage the students because the students could not communicate their groups discussions in English. The participants argued that students in CDSS have difficulties to communicate in class hence fail to utilize the skills learned from SMSSE. One participant said:

> *The work we do at CDSS is much more because our students are leftovers of national secondary or district secondary schools. So, they are slow in understanding hence slow the coverage of the syllabus the moment you want to engage everyone* (interview with participant 1 on 14/02/2014)

It was fortunate to find that some of the science teachers were head teachers at some schools. For example, one head teacher said, "*I am a SMASSE trainer myself and I encourage teachers to always utilize the activities so that learners can improve their achievement*", (interview with participant 4 on07/03/2014). Analysis of the documents at the school, especially the MANEB pass rates for this headteacher's school, showed that the students' achievements were indeed improving as the table below shows:

Table 3: MSCE performance at school 14

	MSCE pass rates (%)	JCE pass rates (%)
2017	59.3	-
2016	41.1	100
2015	60.5	93.5
2014	47.5	85.6
2013	61.5	97.2
2012	37.3	79.8

Although the said head teacher proudly acknowledged increase in students' performance due to SMASSE's incorporation of students activities, interviews with the participants explained that the pass rates were inclusive of other subjects. The performance in science were still lower than in other subjects though the pass rates were improving, showing that quality education was being offered there.

4.2.2 Student centredness (S)

Teachers reported that they incorporate student centred skills in their classrooms. Most of the teachers said they ask questions so that students should answer instead of lecturing the lesson. The teachers used a variety of skills in their lessons. However, the lesson observation revealed that teachers remembered student activities (A) in their responses instead of student centred skills. The essence of student centred pedagogies is to allow learners interact with the concepts by sharing their knowledge and increase activities in generating the new knowledge (MacCarthy, 2015). Children learn better when they are actively engaged as the ASEI and constructivism theory argue (Kalpana, 2014; Taber, 2011). The findings showed that teachers were unable to ingrain students do something to show to the class, to make predictions of outcomes, to discuss their differences or misconceptions and giving out their prerequisite knowledge in the course of learning.

Based on the SMASSE checklist, it can be said that teachers demonstrated lack of this skill. During class observation, it was found that the activities the teachers designed controlled the students much that the activities were teacher centred. One participant said, *"Student centred skills are achieved when I give them a practical work. I give them instruction and demonstrate how it is done"*, (interview with participant 3 on 07//03/2014). This statement reveals that students observe the teacher doing the practical task and they just imitate what their teacher did, making the lesson teacher centred. SMASSE Malawi expects the trained teachers to shift from didactic teaching methods to learner centred pedagogies. Teachers need not to dominate the teaching and learning process but accord the students sufficient time to interact with the concepts in the learning process (Kamoto, 2017).

4.2.3 Experimentation (E)

Experimentation (E) was another skill that revealed that teachers understood it differently. Interviews with mathematics teachers showed that all but one teacher knew that there is experimentation in mathematics. That respondent said, *"There are experiments in maths only that they have unique steps to arrive at a conclusion unlike in Biology or Physical Science."* He argued that the steps laid down for solving mathematical problems are the procedures one follows to reach a conclusion or an answer to the problem. The rest of the mathematics teachers denied having done experiments in mathematics. One of them said, *"I don't do experiments in mathematics. It is for Biology and Physical Science but not mathematic"*, (interview with participant 9 on11/03/2014).

Biology and Physical Science teachers reported that they utilize the skill of experimentation depending on the availability of chemicals and apparatus. One participant said, *"I conduct experiments depending on the availability of chemicals and the nature of the topic"* (interview with participant 6 on11/03/2014). Experimentation expects the SMASSE trained teachers to shift from large class participation to small scale experiments by individual students or in small groups. Students should be provoked to make predictions, hypotheses and verify their answers with experiments or practical activity (Kamoto, 2017). In her study, Kamoto (2017) found that participants' performance on this skill was lower than other ASEI concepts.

4.2.4 Improvisation (I)

The skill of improvisation requires science teachers to adopt materials from their local environment to arouse students' interest in the lesson (Kamoto, 2017). It was found that biology teachers used this skill more than mathematics and physical science teachers. Odawa et al. (2014) found similar results that biology teachers utilized successfully the improvisation than other science subjects in Kenya. However, this current research contrasted with other findings in Kenya that biology teachers lagged in the utilization of ASEI/PDSI concepts compared with mathematics and physical science teachers (JICA IFIC, 2007a). Figure 2 summarizes the findings on teachers' utilization of improvisation.

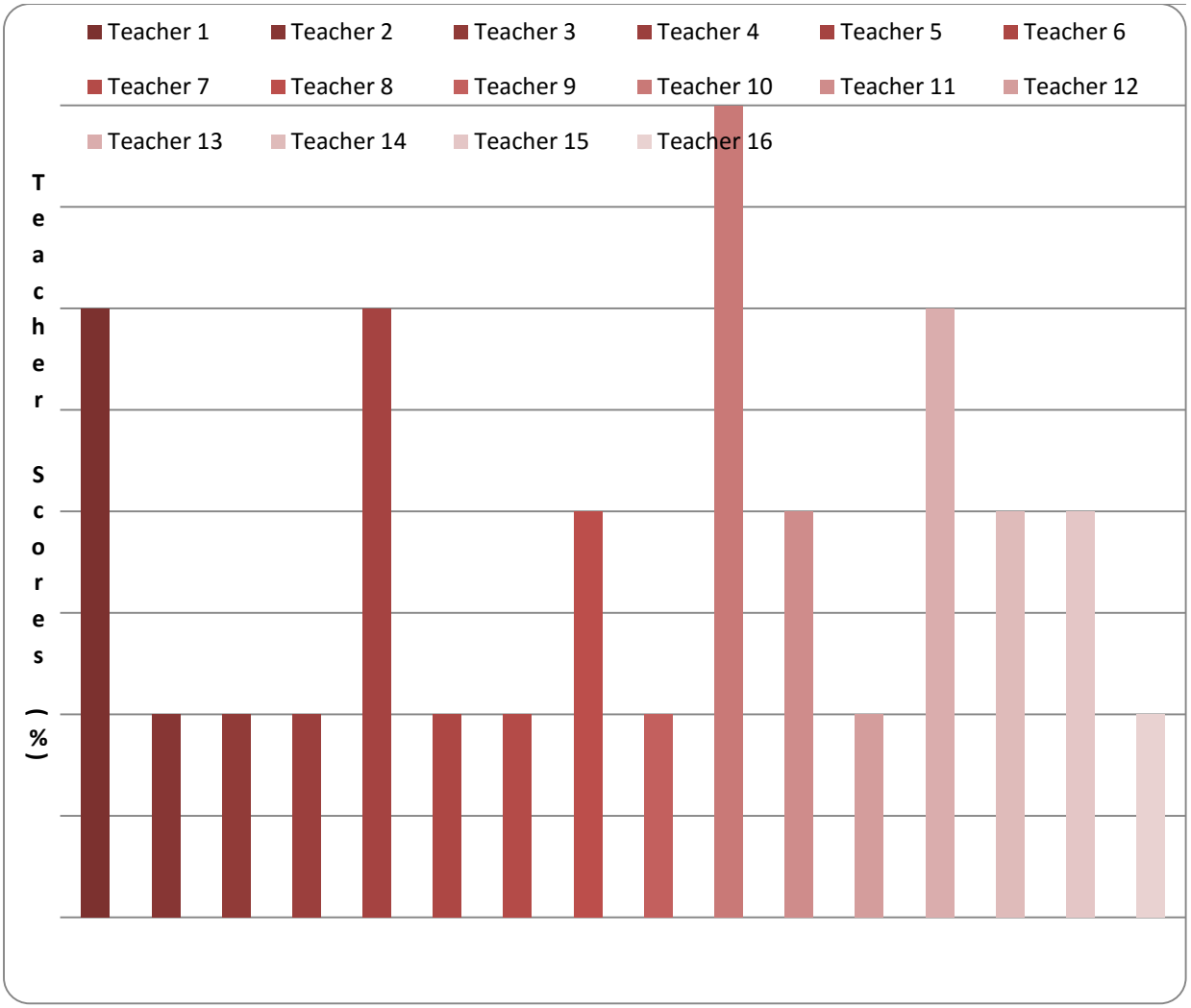

Figure 5: Teachers' utilization of Improvisation

Thelesson observation showed that four teachers of biology used the skill of improvisation above fifty percent. Three of them scored up to sixty percent. The same graph showed that four Mathematics teachers scored forty percent. The eight teachers had the same score as they argued that there was no improvisation of chemicals. These were mostly physical science and mathematics teachers. This graph shows that the skill of improvisation was mostly used by biology teachers than other science subjects in the study area. Interviews with the participants differed in that most teachers explained that they used improvisation skill. One biology participant said:

> *All the methods we discussed at SMASSE are important. They have helped me to improve my teaching methods and applying hands-on methods especially in biology. I use trees, food samples actually…….so, so many things are found here.*

Lesson observations found that most biology teachers used the local environment very often and improvised many materials for demonstration of concepts. A participant from CDSS5 pointed out that many topics in biology are drawn from the immediate environment where examples are easy to improvise. She said:

> *I am free in biology to use the environment and improvise certain materials to fit the topic. For example: I use trees to teach stems, leaves and flowers, transparent plastic bottles for beakers and maize grains, beans and groundnuts to demonstrate a community in an ecosystem* (interview with participant 15 on 10/03/2019).

The findings showed that teachers had improved positively in their understanding of the topics and the new pedagogical skills reported above. This meant that teachers were positively impacting the Malawi National Youth Policy due to the utilization of the students' centred pedagogies.

Interviews with the heads of the science department (HODs) showed that some of them had difficulties to utilize the skill of improvisation just like the teachers. Figure 3 shows how heads of the department performed on the SMASSE checklist on improvisation. As it can be observe in the graph, three HODs adequately improvised materials in their department but seven of them improvised material less than forty percent. Three other HODs did not accept or deny the skill of improvisation in their department. So, it can be argued that up to ten HODs have improvised resources in their department for utilization. However, it was clear that most MSCE and Diploma holders found that the skill of improvisation widened their knowledge which they can utilize in the actual classrooms. In addition to improvisation, teachers were also observed on how they plan their work.

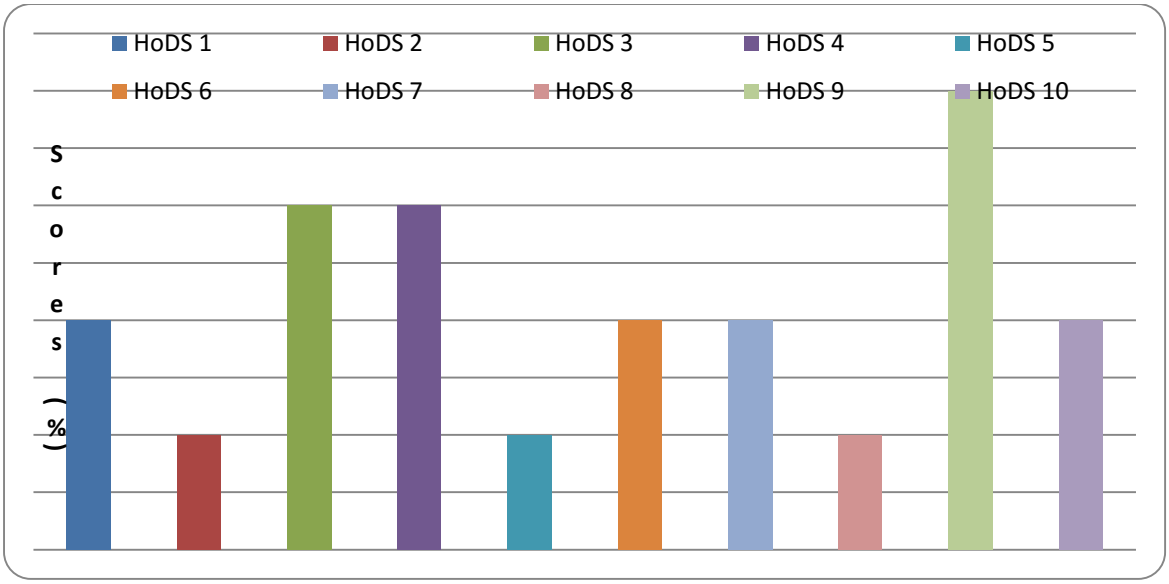

Figure 6: HODs Utilization of Improvisation

4.2.5 Planning (P)

Another area that SMASSE checklist for lessons assessed was the skill of planning which included the following: teaching and learning materials, schemes and records of work and lesson plans. Results from the lesson observations are summarized in Figure 4 below.

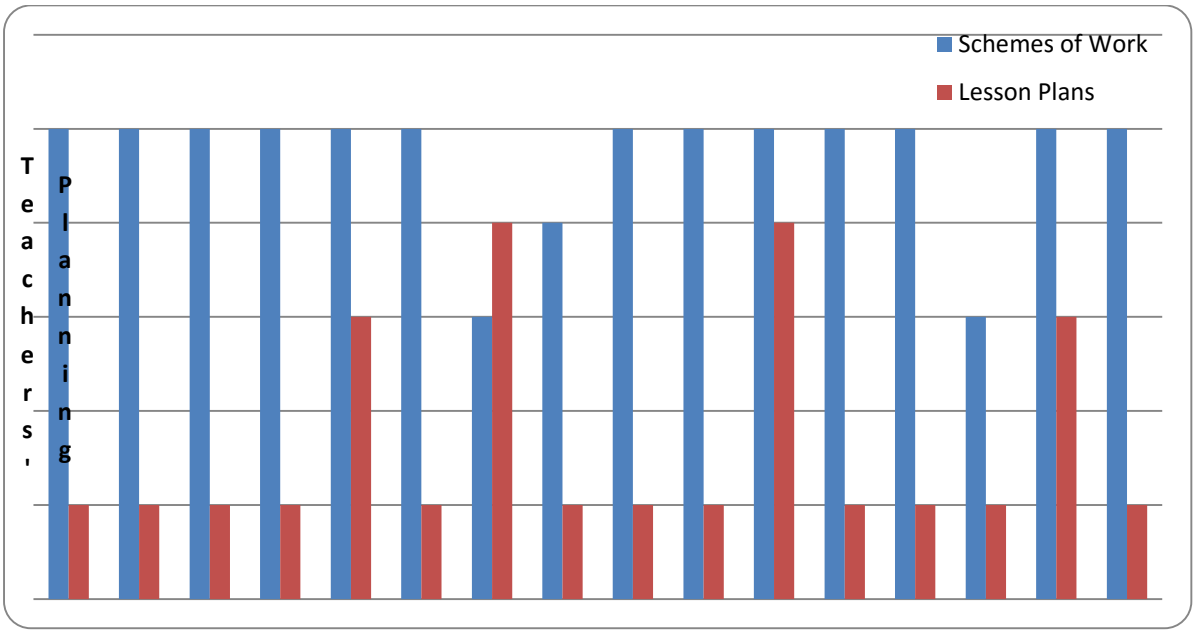

Figure 7: Teachers' utilization of planning skills

Figure 7 shows that all the teachers had drawn schemes and updated the records of work. Document analysis showed that three teachers updated their records of work between 60 and 80 percent of the term. The rest of the teachers utilized this skill perfectly as the graph shows. The documents also agreed very well with the interview results in which almost all the teachers said they could not teach before drawing a scheme. HODs and headteachers unanimously pointed out that they provide scheme pads towards the end of each term in preparation of the next term.

One HOD said, "*Our headteacher gives us the scheme pads in advance which we in turn distribute to our members in the department*." The schemes further revealed the teaching methods teachers intended to utilize in the course of delivering lessons. Most of the schemes showed discussions and group works as common skills. Kamoto (2017) also found that most teachers utilized group works and class exercises as students activities incorporated in the teaching and learning process.

Document analysis found that most schemes did not plan their work based on the logical sequence of topics in the syllabus which build on each other as the constructivism learning theory advocates. So, scheming without following this did not set transition of knowledge from known to unknown hence, the learning may not be effective. Heads of the science department and head teachers stressed that the topics need to be arranged in an order that each one builds on the previous topic. One head teacher said, *"The arrangement of topics in the syllabus are inter-related and teachers must follow the same order and not otherwise."* This argument was echoed by heads of science department in all the schools. One of them said:

> *In science, the topics in the syllabus are interdependent because you cannot start teaching respiration before you teach digestion in biology. Digestion should be taught first i.e. the food is assimilated in the cells where it should be broken to release energy which is respiration.*

Lesson observation showed that teachers did not utilize the skill of drawing lesson plans. As it can be seen that only four teachers had lesson plans which they also utilized in their classrooms. They scored between 60% and 80% in the utilization of the lesson plans. This meant that the four teachers adequately utilized this aspect of planning on the ASEI/PDSI concept. Twelve of the teachers, representing 75%, in the study area utilized planning unsatisfactorily. Respondents reported that they could not finish the syllabus because lesson plans are time consuming and slow. This was due to the nature of the students found in CDSS who need more time to understand the concepts. A participant at CDSS 14 said, *"Lesson plans are good, of course, but we cannot finish the syllabus if we use it as primary school teachers do."*

On interviewing the participants, most of them preferred lesson notes to lesson plans. Kamoto (2017) found that teachers planned their work in advance but did not write lesson plans. For them, planning a lesson does not only mean writing on paper. Many of them stressed that lesson plans were necessary at primary school not secondary school level. A participant from CDSS 10 said:

> *Lesson plans are meant for the primary school while at the secondary level we use lesson notes. Every secondary [school] teacher used a lesson plan for the sake of TP [teaching practice] thereafter, we just use these lesson notes.*
>
> (interview with participant 5 on 07/03/2014)

The belief that lessons are meant for primary school teachers was stated by many participants. Some participants pointed out that they did not use lesson plans because they slow the pace of covering the syllabus. A participant from CDSS 3 said, "*I don't have a problem to use the LP [lesson plan] but if I don't finish the syllabus the pupils will fail their exams*." From the arguments above, it was clear that many SMASSE trained teachers did not use ASEI lesson plans in their classrooms as it can be observed from the graphs above. It was argued that good pedagogical methods in the lesson delivery have positive impact on the learning of students. Wrong choices of teaching methods have negative impacts on the learning process (de Souza Barros & Elia, 1998; Villegas-Reimers et al, 2003).

4.2.6 Improvement (I)

The last item on the SMASSE lesson observation checklist was assessing the lesson improvements. It aimed at knowing if the teachers were flexible to adjust the direction of the lesson depending on the learning needs of the students. On this element, lesson observations indicated that all the teachers rephrased the questions or the instructions so that students should grasp the gist of the given activity. Despite that teachers repeated questions or instructions, the teachers did not adjust the teaching methods in an attempt to direct the students to the desired concepts. Many of the asked questions were not answered adequately by students. The students were not given enough time to theorize the concepts because the teachers were against the time for a single or double period. This observation revealed that there were some challenges the teachers encountered during the lesson delivery. The overall picture of how teachers utilize the ASEI/PSDI concept in the actual classroom is that most teachers are utilizing the pedagogical skill below fifty percent. Those that utilize above fifty percent encounter a number of challenges which fail them to implement the ASEI/PDSI concepts in the actual classrooms. The next section discusses the last research question on the challenges teachers face when implanting the ASEI/PDSI pedagogical skills.

In summary, the findings on teacher utilization of ASEI/PDSI principles showed that teachers were able to utilize the principles. There was a positive change among the participants in the study area. This study found that teachers utilize student Activities and Improvisation on ASEI and Planning and Improvement on the PDSI. Student centredness and Experimentation were missing both in the teachers understandings as exemplified by the interviews and in their implementation of the lessons. On PDSI, teachers could plan schemes of work and complete records of work. However, most of them did not do lesson plans which was a drawback. The teachers, however, showed that they could somehow reflect on their lessons by showing willingness to improve. The teachers who have attended SMASSE training have become more effective and efficient than before. This effectiveness was seen as they developed

the students to realize their potential as the Malawi National Youth Policy stipulated. This is in line with the main reasons for the Malawi national secondary school curriculum which stated that students achievement made at school should be applied in real life situation after schooling (GoM, 2013). SMASSE is, therefore, contributing to the implementation of the youth policy in Malawi by developing the students for the labour market.

4.3 Challenges in the classrooms

The ASEI/PDSI concept has an aspect of checking the success of the lessons and allowing room for improvement. The last research question combined the lesson evaluation and improvement aspects on the ASEI/PDSI concept so that the challenges facing teachers could be revealed and examined.

Participants told the researcher that there were indeed challenges they met as they utilize the pedagogical knowledge in class. The challenges were two-fold: students' challenges, teachers' challenges and administration challenges.

On students' challenges, the findings of this study indicated that English language as a medium for instruction was the major challenge. Lesson observation in twelve CDSSs showed that discussions among the students were done in Chichewa or Chiyao and students failed to present their work in good English. The only exception was CDSS 9 where the students showed strong understanding of the concepts and presented their group work much better than their counterparts. Interviews with teachers revealed that students failed to comprehend issues adequately in English language.

One respondent from CDSS 11 argued that the pupils are unable to speak or understand English sufficiently to theorize the concepts in the course of lessons. He said, *"I usually attempt to give them work in groups but these children are half baked at primary school. They don't seem to know anything in English."* That participant deplored this lack of comprehension of issues in English because he wondered whether students get what he teaches as he used English in class to teach science or mathematics.

Another participant agreed with this challenge saying:

> *In our school we have tried several times to force pupils speak English at school but a!a!a!a! These pupils…..just look at you without speaking anything. They want to answer questions in their mother tongue.*
> (interview with participant10 on 11/03/2014).

It was observed that most students struggled to speak with each other in communicable English during group activities. The headteachers also noted that the use of English language as a medium of instruction presented challenges for the students to grasp the concepts in CDSS. One headteacher said:

> *I often go round the school as if I am just walking but I check what is going on in different classrooms. Many times I hear a teacher explaining mathematics, biology or physical science using Chichewa language hoping that students will understand the concepts better.*

Lesson observation also found that teachers had the tendency of giving explanations in vernacular language. In addition to the challenge of English language, this study also found that students did not like group works because they perceived the teacher's lack of knowledge on the topic and waste of their time. The students had the expectation that teachers will give the knowledge not them making meaning of the discussions. So, the teachers who attempted to do this were labeled lazy and ignorant in their subject areas. The finding above showed the lack of appreciation on the part of students' centred pedagogies. This finding seems to reveal that teachers did not explain the significance of utilizing student centred methods in class. Teachers were expected to give a rationale of the group works in advance so the students know why they were put in groups while learning. Respondents from six CDSSs experienced such a resistance from pupils but through continuous use of group works, the pupils started appreciating that pedagogy. It seems that teachers rarely used student centred methods.

The challenge from the administration was lack of financial and material support. Participants and heads of science department unanimously stated that headteachers were usually reluctant to disburse finances which could be used to buy teaching materials to be used in the lessons. A participant from CDSS 6 said:

> *I usually get angered by the administrators whenever I ask for money to purchase teaching materials because they think the money will be wasted. So, I just leave it like that and teach theoretically without much hands-on activities*. (Interview with participant 2 on 14/02/2014)

However, head teachers denied this sentiment saying depending on the funds available, they provide financial and material support to the science teachers and the assistance is timely.

Lesson observation and observation in most laboratories revealed that there were very few things which headteachers could claim to have bought for the department, especially the apparatus and chemicals. Interviews with the respondents on this challenge indicated that the apparatus and chemicals available in some laboratories (CDSS 1, 3, 4, 9 and 11) or storerooms (CDSS 2, 5, 6, 7, 8, 10, 12 and 13) were bought during the MANEB practical examinations and the pupils themselves paid money for those practical examinations.

4.4 Chapter summary

This chapter has presented research findings which were guided by the ASEI/PDSI conceptual framework. The study used both quantitative and qualitative techniques. The results were categorized into three themes. These themes were already developed by SMASSE Malawi in the ASEI/PDSI concepts. So, the research questions were framed to reflect the ASEI/PDSI concepts. The findings were discussed, reflecting the participants' responses. Tables and frequency graphs were used to present summaries of the findings in this study.

Overall, the findings showed that teachers gained and improved their pedagogical knowledge in their subject areas. Teachers had also improved their utilization of the ASEI/PDSI concepts in their classrooms. The positive change had positive impact on the Malawi National Policy in an attempt to develop the students as the country's human capital. However, most teachers were not aware of their specific tasks in order to help implement this policy. The next chapter discuses, concludes the findings and makes recommendations emanating from these findings.

CHAPTER FIVE

CONCLUSIONS AND IMPLICATIONS

5.1 Introduction

This chapter makes conclusions based on the findings as presented and discussed in chapter four. It summarizes the study and makes conclusions of the study. It ends with suggestions on areas for further research.

5.2 Study Summary

The main aim of the study was to investigate the impact of teachers' utilization of the students' centred pedagogies to the Malawi National Youth Policy. The important principle of the MNYP was that education develops the capabilities of the youths, enrich their knowledge and improve their technical skills that raise their employability as the country's human capital.

5.2.1 Teachers' knowledge of pedagogies

The findings showed that teachers were able to remember the topics and their teaching pedagogies covered for the previous years. They displayed understanding of the topics and their pedagogical skills. Teachers managed to recall and incorporate a variety of teaching methods learned from SMASSE trainings. This study, therefore, concludes that teachers have changed positively in their mastery of the subject matter and their pedagogical skills in various topics.

It was evident that each topic covered incorporated the teaching methods suited for that content. It is concluded also that Biology and Mathematics teachers recalled many pedagogies than Physical Science teachers. It is further concluded that the number of years a teacher had served had a positive impact on mastering the content of the topics and the teaching methods suited to teach that content.

5.2.2 Teachers' utilization of the student centred pedagogies

Teachers demonstrated the skill of incorporating students' activities and the skill of improvisation. Teachers were able to engage the students through group works and utilizing the locally available resources to enhance students' understanding in class. This study, therefore, concludes that teachers are mainly utilizing student activities (A) and improvisation (I) in their lessons in the classrooms. It is concluded that only two ASEI/PDSI concepts of student activities and improvisation were utilized by the teachers. It is concluded that Biology teachers utilized student activities and improvisation more than Mathematics and Physical Science teachers. The incorporated activities and the improvisation had a positive reinforcement in the part of the students in class. This study also concludes that teachers still need strengthening for them to ingrain and utilize the remaining concepts especially the planning of lessons and delivering student centred lessons in the actual classrooms.

Overall, this study concludes that teachers had positively changed their classroom practices by incorporating student activities and improvisation. This change had positive impact on the Malawi National Youth Policy in developing the students' potentials as the country's human capital. However, most teachers lacked knowledge and expectations of the Malawi National Youth Policy.

5.2.3 Teachers' challenges of implementing the pedagogies in class

In terms of the challenges, this study concludes that the use of English as a medium of instruction had negative impact on the utilization of the ASEI/PDSI concepts. Teachers had difficulties engaging the students in the course of group discussions or student presentations in class. This challenge had negative impact on the development of the students as the future human capital for Malawi.

5.3 Implications of the findings

The main implication of this study is that teachers are positively developing the students as the future human capital. This was reflected in the incorporation of student activities and improvisations in their lessons which provoke and stimulate the students in class. However, ASEI/PDSI concepts base very much on the planning of the lesson. Without planning, teachers are unable to deliver their lessons effectively and efficiently. This made students achieve less in the classroom (Kamoto, 2017). The low students' understanding of the concepts has a negative effect on the preparation of the youths for economic development as advocated by the Malawi National Youth Policy. Teachers are failing to write the lesson plans for every lesson they intend to teach. Due to lack of this kind of planning, teachers and students are unable to adequately gain the scientific knowledge as the future human capital in line with the Malawi National Youth Policy.

5.4 Suggestions for further studies

Based on the findings, there is need for further research on the following areas:

a. Investigating the impact of English language as a medium of instruction in community day secondary school in Malawi
b. Investigate the roles of teachers in the implementation of the Malawi National Youth Policy.

5.5 Chapter summary

This chapter has presented the main conclusions drawn from the findings in chapter four. The overall conclusion is that the utilization of the ASEI/PDSI has positive impact. The pedagogies help develop the students' potentials as the country's human capital. However, teachers seemed unaware of this policy, their roles and expectations in the implementation of the Malawi National Youth Policy.

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APPENDICES

Appendix 1: Introductory Letter

CENTER FOR EDUCATIONAL RESEARCH AND TRAINING

DIRECTOR
Dorothy C. Nampota, DipED, BED, *Mlw*, MA *Lond*, PhD *Bath*

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17th March, 2014

The Education Division Manager,
South East Education Division,
Private Bag 48,
Zomba

Attn: Mr. G. Alufandika

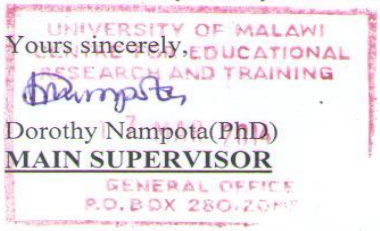
Dear Sir,

RE **LETTER OF INTRODUCTION TO CARRY OUT A STUDY IN ALL CDSSs IN BALAKA DISTRICT**

I write to introduce Mr. Felix Daniel Dzonzi Kusamba the bearer of this letter and request permission for him to conduct a study entitled **"Investigating the extent to which CDSS teachers utilize the knowledge and skills gained from SMASSE training"** in all community Day Secondary Schools in the district.

Mr. Kusamba is a master's student studying Education Policy, Planning and Leadership programme in the University of Malawi, Chancellor College. The research is therefore being conducted in partial fulfillment of the obligations for the master's programme. Being a science teacher, he is interested to collect data from Biology, Mathematics, Physical Science teachers in the schools.

The assistance you may render to him will be greatly appreciated.



Yours sincerely,

Dorothy Nampota(PhD)
MAIN SUPERVISOR

Appendix 2: Individual Teacher Interview Guiding Questions

1. a. What knowledge have you gained from SMASSE trainings from the time you started to the present time?
   b. What skills have you gained from SMASSE trainings from the time you started to the present time?
2. To what extent do you utilize/use the knowledge and skills gained from SMASSE in the actual classroom when delivering your lessons?
3. How do you understand by students' activities according to ASEI/PDSI?
4. To what extent do you include these activities in your daily lessons in the actual classroom?
5. Define the term "student-centredness" according to ASEI/PDSI? Is there any difference between learner centredness you covered at College and the SMASSE's student-centredness?
6. How do you ensure that your lessons are student-centred in the actual lesson delivery?
7. How do you understand by experiments according to ASEI/PDSI?
8. How often do you carry out experiments in your lesson delivery?
9. What is improvisation according to ASEI/PDSI?
10. To what extent do you utilize improvisation in your lessons?
11. Differentiate teaching and learning using the locally available resources (TALULAR) from improvisation.
12. How do you make an ASEI/PDSI lesson plan?
13. How do you utilize the ASEI/PDSI lesson plans in the actual lessons you deliver?
14. How else do you plan your work according to SMASSE?
15. How do you understand by "Do" in ASEI/PDSI?
16. How do you conduct your lessons?
17. How do you "see" your lesson delivery according ASEI/PDSI?
18. What do you do when your lessons have not achieved the prescribed objectives?
19. What are some of the challenges (if any) you meet when implementing ASEI/PDSI in the actual classroom?

Classroom Lesson Observation checklist (adopted from SMASSE)

Participant No: …… School…….District…… Date …...

Class……Subject……..Topic……

Learner Activities

1	Did the teacher incorporate activities for students into the lesson?					
2	Did the teacher successfully engage students in the activities?					
3	Did the activities arouse students' interest?					
4	Were the activities objectives-oriented?					
5	Did the teacher give students appropriate tasks for discussions?					
Student centredness						
6	Did students do something to show the whole class or group?					
7	Did students give their prior experience or explain their ideas related to the content?					
8	Did students give their own predictions/suggestions on their own?					
9	Did students give their own observations/results of their activities					
10	Did students discuss their differences according to their observations?					
11	Did the teacher summarize the lesson by giving clear explanations?					
12	Did the students evaluate the lesson?					
Experiment i.e. activities to verify the predictions/suggestions of the students						
13	Was an activity or experiment conducted?					
14	Did students deduce the theories/concepts from the activity/experiment?					
15	Did the teacher relate the activity/experiment to theories/concepts?					

Improvisation

16	Did the teacher simplify methods for activities (efficient resource use)?					
17	Did the teacher utilize materials available in the environment?					
18	Did the teacher use improvised materials/equipment for activities?					

Planning						
19	Did the teacher prepare the lesson plan?					
	Was the lesson presented well i.e. not haphazard?					
20	Did the teacher prepare for appropriate materials to aid learning?					
Seeing						
21	Did the teacher pay attention to students' progress in the lesson?					
22	Was the teacher keeping a good eye contact with students?					
23	Did the teacher invite questions from students in the lesson?					
24	Did the teacher ask questions to check learns' understanding?					
Improving						
25	Did the teacher rephrase questions/instructions where necessary?					
26	Did the teacher give further guidance to students' activities?					
27	Did the teacher adjust the lesson where necessary?					
28	Was the teacher able to indicate points to improve?					
Scoring						

Comments: