TRAINING STUDENT-TEACHERS ON TLMs DESIGN AND PRODUCTION AT ST. AMBROSE COLLEGE OF EDUCATION – DORMAA AKWAMU, BRONG AHAFO REGION OF GHANA

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DECLARATION

I hereby declare that this submission is my own work towards the award of Master of Philosophy in Art Education and that, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the university, except where due acknowledgment has been made in the text.

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ABSTRACT

Education is very crucial in the development of every nation, and TLMs play critical role in the teaching and learning processes globally. The study focused on uncovering deficiencies and inefficiencies on the use of TLMs by student-teachers of St. Ambrose College of Education; and equipping them with requisite knowledge and skills for TLMs selection, design, production and utilization. The research design used was qualitative, and the method employed in conducting the study was action research. The target population for the study was 360 student-teachers, which is the entire students' population of St. Ambrose College of Education, Dormaa-Akwamu. The accessible population was 90 student-teachers, consisting of 60 second year visual art student-teachers and 30 final year student-teachers on practicum, who were sampled using convenience and purposive sampling techniques respectively. Personal observations and one-on-one interview were the research instruments used, and the result revealed lack of knowledge and skills on the part of student-teachers regarding TLMs design and production. Student-teachers were then equipped with the needed knowledge and skills for TLMs selection, design and production through training. The outcome of this training was massive, and six new TLMs were produced and tested in real classroom lessons. The test-results of all the six TLMs were positive as they were appropriate and effective for the lessons. The level of improvement attained by the student-teachers at the end of the training was very huge when the new TLMs produced were compared to the old ones used by their colleagues on the practicum. The study recommends that, skills development in TLMs selection, design, production and utilization should be integrated into the curriculum of colleges of education in Ghana, to make teachers more resourceful and efficient.

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DEDICATION

I dedicate this thesis to the Almighty God and my children, Jed Jabaah Kyeremeh and Queena Kumi Kyermeh. It is upon the future aspirations and academic pursuits of these kids that motivated me to work tirelessly to make this thesis a success.

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INTRODUCTION

1.0 Overview

This chapter provides the background to the study and states the problem under study. It presents objectives of the study, research questions, delimitation, limitations, definitions of terms and abbreviations used. The chapter further gives the importance of the study and organization of the rest of the text.

1.1 Background to the Study

Education is a fundamental human right and a major driver of human and economic development. Teaching and Learning Materials are fundamental media for inducing learning; and teachers, play the crucial role in this educational process. The quality and efficiency of teachers largely depend on teachers' training. The proficiency of a teacher to utilize TLMs effectively in the classroom to transfer content to the pupils depend on his/her knowledge and skills. All materials and resources used for imparting the desired knowledge, skills, attitudes or values in pupils are regarded within the scope of teaching and learning materials (Simsek, 2003). These materials are objects, devices or anything which help the teacher to make learning meaningful to the learners (Ikerionwu, 2000). Teaching and learning materials are very critical to any successful teaching and learning process worldwide. This is because these resources enable the teacher to effectively transfer the content to the learners (Karaka, 2007). Fidan (2008) reports that teaching materials make lessons more enjoyable, increase motivation and provide enduring learning process.

While some educators are fascinated by the power of instructional materials in enhancing teaching and learning, other teachers lagged behind in using instructional materials to teach (Bolick, Berson, Coutts and Heinecke, 2003). Most student-teachers who were supervised during the practicum lacked the proficiency in selecting, designing, and producing appropriate TLMs to facilitate teaching and learning activities. This may due to the fact that, the curriculum which prepares teachers in the Colleges of Education does not inculcate in the student-teachers the requisite knowledge and skills in selecting, designing and production of TLMs. According to the University of Cape Coast Syllabus for Three-Year Diploma in Basic Education Programme (2014), teacher training programmes should ideally aim at achieving quality instruction necessary to meet society's teacher demands and expectations. A close study of the current syllabus for Collages of Education in Ghana by the researcher established that, it is insufficient to inculcate in the student-teachers the requisite knowledge and skills in design and production of appropriate TLMs.

Timperley, Wilson, Barrar, and Fung (2007) highlight the importance of giving teachers the authority to design their lesson plans in a way that fits their own teaching style so as to benefit the students. It is therefore very imperative for teachers to design their own TLMs so that desired learning outcome could be achieved. Training student-teachers on TLMs design and production would instill in the trainees the spirit of improvisation. The environment is richly endowed with material resources that could be utilized for improvisation (Koppett, 2001). If teacher trainees are equipped with the knowledge and skills in designing and production of TLMs, they would be able to utilize objects found in their surroundings to make their own teaching and learning materials, and use in the classroom. Osho (2011) argues that teachers need to harness the opportunity provided by

the abundance of resources to produce variety of TLMs that can bring about concrete and meaningful learning. Teachers can design and produce their own materials if they have the requisite knowledge and skills in TLMs. The role of the teacher is to facilitate learning through the use of teaching and learning resources.

Isman, Caglar, Dabaj, Altınay, and Altınay, (2004) argue that with the developments in information and communication technologies, all applications of the instruction start to have tendency toward technology based instruction instead of directed, teacher-centered instruction. Woodrow, Mayersmith and Pedretti (2000) assert that teaching with multimedia, when compared to the one in a traditional setting, leads to a positive change in students' attitudes towards lessons. Unfortunately, lack of ICT resources: both hardware and software, and lack of competent teachers to integrate ICT tools effectively into teaching and learning have been very challenging in developing countries such as Ghana.

As a result, traditional teaching and learning materials such as charts, manipulative, diagrams, pictures and illustrations, among others are very useful in education today. Indeed, the use of appropriate TLMs makes teaching and learning very attractive, interesting, and increase learner's participation and understanding. It is against this background that the researcher is embarking on this study to inculcate in the teacher trainees the requisite knowledge and skills for TLMs design and production; so that teacher trainees would be proficient in selecting, designing, producing and utilizing TLMs effectively to improve teaching and learning in the basic schools.

1.2 Statement of the Problem

Education is very crucial in economic, social and national development; and basic schools are fundamentals in Ghana Educational System. Providing good foundation for basic school pupils will likely brighten the chances of individuals' future academic pursuits and aspirations. Teachers play critical role in providing quality education. Barber and Mourshed (2007) argue that, the most significant factor to determine the efficiency of school system is the quality of teachers who induce learning. Teachers play an influential role in improving learning outcomes (Timperley et-al, 2007). Instructional materials are next to the teacher who plays a central role in the classroom instruction. Appropriate and standard instructional materials are very essential ingredients in successful teaching and learning (Association of American Publishers, 2015). Learning and teaching materials are critical ingredients in learning and the intended curriculum cannot be easily implemented without them (The World Bank, A Chance to Learn, 2001).

The current policy directives for the 3-year Diploma in Basic Education are mainly geared towards the training of a generalist teacher who would be able to teach at both Primary and J.H.S. levels (UCC Syllabus for Three-Year Diploma in Basic Education Programme, 2014). Per these policy directives, graduates from colleges of education are expected to teach at basic school level; where the use of TLMs is very crucial. Inappropriately, the current curriculum for Colleges of Education does not inculcate in the teacher trainees the knowledge and skill development in TLMs. Teaching at basic school level requires that the pupils are exposed to some form of simulation. Oppong, Amissah, Asemanyi and Ziggah (2009) assert that pupils should be given the opportunity to manipulate teaching and learning materials for a better understanding of the topic. It is

believed that, students are able to retain only 10% of what they hear, 40% of what they see but 90% of what they do. It is therefore, imperative on the part of the teachers to use as many relevant instructional materials as possible to facilitate the retention.

The situation on the ground is that, most student-teachers lack the requisite knowledge and skills in selection, design and production of TLMs to facilitate teaching and learning activities. This may due to the content-oriented nature of current curriculum for colleges of education in Ghana, which does not impact in the teacher trainees the needed knowledge and skills for selection, design and production of TLMs. Curriculum has been a new focal point of school reform activity. There is a new direction to transform content driven curricula with relevant and applicable knowledge (Westbrook et-al, 2013). Indeed, the current syllabus for visual arts at colleges of education does not provide enough knowledge and skills on TLMs selection, design and production to the teacher trainees.

Consequently, these trainees become deficient in selecting, designing and producing suitable materials to transfer content effectively unto pupils in the basic schools. The selection of instructional materials can have an impact as great as or greater than the impact of teacher quality (Grover, 2009). Teaching and learning materials are very effective when they are at the appropriate level of pupils and relate directly to the topic under study (Hewlett Foundation, 2014; McEwan, 2013). Since teacher trainees are not taught how to select, design and produce their own teaching and learning materials, they may end-up not selection appropriate TLMs or not utilizing them at all in the classroom.

Per the researcher's observation as a tutor at St. Ambrose College of Education, Dormaa-Akwamu, most student-teachers are deficient in selecting, designing and producing appropriate TLMs during the practicum. The few student-teachers, who are able

to select appropriate materials; either cannot employ them effectively in their lessons to induce learning or forget these materials in the teaching and learning process. Student-teachers perceive TLMs as obligatory, as specified in the Institute of Education – UCC current assessment plan for student-teachers on practicum (see Appendix C), rather than its core function of facilitating teaching and learning. This alarming situation has been one of the common mistakes perpetrated by many student-teachers, and this is as a result of the lack of knowledge and skills in TLMs selection, design, production and utilization.

In responding to the above anomalies in the teaching profession, the researcher intended to embark on this study to train student-teachers at St. Ambrose College of Education-Dormaa Akwamu; so as to equip them with requisite knowledge and skills for selection, design, production and utilization of appropriate TLMs. This in effect would help to make teaching and learning more interactive, more interesting, more participatory and very motivating.

1.3 Objectives

The study seeks to achieve the following objectives:

1. To investigate the proficiency of students-teachers in TLM design, production and utilization.
2. To equip student-teachers with requisite knowledge and skills for selection, design and production of appropriate TLMs.
3. To test the TLMs produced by the student-teachers in lessons.
4. To compare TLMs produced by the student-teachers with the previous ones used by the student-teachers on internship programme.

1.4 Research Questions

1. How proficient are students-teachers in TLMs design, production and utilization?
2. What measures can be employed to equip student-teachers with requisite knowledge and skills for selection, design and production of appropriate TLMs?
3. How effective are the TLMs produced by student-teachers after testing?
4. What is the level of improvement on the TLMs produced by the student-teachers as compared to the previous ones used by the student-teachers on internship programme?

1.5 Delimitation

The study is confined to uncovering deficiencies and inefficiencies on the use of TLMs by St. Ambrose College of Education student-teachers on the practicum; and helping them to acquire requisite knowledge and skills for TLMs selection, design and production. The TLMs produced by the student-teachers would be compared with the old ones used by the student-teachers on internship programme. Finally, the TLMs produced by the student-teachers would be tested in the real classroom lessons. Geographically, the scope of this study covers the entire students' population of St. Ambrose College of education, Dormaa-Akwamu.

1.6 Limitations

Combining teaching at St. Ambrose College of Education and research (thesis) was a herculean task for the researcher, which contributed immensely to the delay of this study. Again, sudden change of supervisor beyond the researcher's control in the midway of the

thesis was a major setback, as the researcher had to start afresh with the newly assigned supervisor. Also, conventional school practices such as vacations, sports and examinations; interrupted the researcher's schedules for data collections, and this eventually extended the time allocated for data collection. In addition, when the newly designed TLMs were due for testing, basic schools were on vacation, and this brought the study to a halt until the schools re-opened. Though the above enumerated challenges delayed the scheduled period for the completion of the thesis, yet they did not affect the quality of data attained.

1.7 Abbreviations and Acronyms

- **AP:** Appropriate (Appropriate Teaching and Learning Materials)
- **IA:** Inappropriate (Inappropriate Teaching and Learning Materials)
- **J.H.S:** Junior High School
- **N:** New Teaching and Learning Materials designed by the Trainees.
- **O:** Old Teaching and Learning Materials used by student-Teachers
- **S.H.S:** Senior High School
- **TLMs:** Teaching and Learning Materials. These include all materials and resources which assist the teacher to impart desired knowledge, skills, attitudes, values or behaviour unto the student.
- **T-TEL:** Transforming Teacher Education and Learning. This is the Government of Ghana and United Kingdom Aid, (UK-AID) programmed intended to transform teacher education and learning in Ghana.
- **UCC :** University of Cape Coast

1.8 Importance of the Study

- The study would help to expose some difficulties that student-teachers encounter in TLMs selection, design, production and utilization.
- Again, the study would equip the student-teachers with the needed knowledge and skill for selection, design, production and utilisation of TLMs.
- Also, it would help to outline the benefits of using appropriate teaching and learning materials, and hence, the need to instill in the student-teachers the knowledge and skill development in TLMs design and production.
- Furthermore, the study is expected to spearhead the campaign, so that designers of the curriculum for Collages of Education in Ghana would integrate TLMs design and production into the teacher education.
- Finally, the beneficiaries of this training (teachers-teachers) would be more proficient and productive in the classroom.

1.9 Organisation of the rest of Text

Chapter Two reviews literature related to the topic under study. It summarizes and discusses what other accredited authors and scholars have said about the essence of TLMs in teaching and learning activates. Chapter Three outlines the methodology adopted for the study; hence, it presents research design, population, sample and sampling techniques, data collection instrument, data collection procedures and method of data analysis. Chapter Four reveals the result or findings yielded by the methodology. Chapter Five, which is the final chapter, presents the summary, conclusions and recommendations of the study.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0 Overview

This chapter reviews literature works adduced by accredited authors, scholars or institutions that are relevant to the topic. It also discusses other related research works which lay the theoretical and conceptual framework of the study. The following captions would be considered:

- The concepts of Teaching and Learning
- What are TLMs?
- Benefits of TLMs in Lessons
- Theories on the Need for Teachers to Design and Produce Their Own TLMs
- Curriculum and TLMs
- The Nature of Curriculum for Colleges of Education in Ghana
- The scope of visual art programme in the Colleges of Education in Ghana
- The Design Process
- Making TLMs Using the Design Process
- Characteristics of Good TLMs
- General Guideline on Using TLMs in Lessons
- Theoretical and Conceptual Framework

2.1 The Concepts of Teaching and Learning

Teaching and learning are seen as opposite sides of the same coin. It is believed that, a lesson is not taught until it has been learnt (Oppong, Amissah, Asemanyi and Ziggah, 2009). The outcome of teaching is learning: the permanent change in behaviour. The concepts, teaching and learning have been variously described by different authorities. The following sub-headings have discussed some of the conceptions.

2.1.1 Teaching

Farrant (1996) defines teaching as a planned activity done to effect change in the behavior of learners. Schlechty (n.d) as cited in Amissah et-al (2002) explains teaching as the art of stimulating learners to behave in a way intended to lead to learning. Teaching is done by undertaking a series of activities with the intention of inducing learning. The world Book Encyclopedia (2001), simply explains teaching as assisting other people to learn. According to Bruner (1994), teaching is the capacity to transfer knowledge to a group of people, or showing them the process or the way something is done. Teaching is not a mere pouring of a body of knowledge to students, rather stimulating learners to use their mental faculties to solve problems on their own (Gibran n.d, as cited in Tamakloe, Atta and Amadehe, 1996).

From the above conceptions, teaching is a process but not an event: it is not limited to only classroom activities rather it involves planning and organizing learning experiences. The use of TLMs is a sure and effective teaching strategy. Oppong, et-al (2009) agrees that pupils should be given the opportunity to manipulate teaching and learning materials for a better understanding of the topic. It is believed that, students are able to retain only 10% of

what they hear, 40% of what they see but 90% of what they do. It is therefore imperative on the part of the teachers to use as many relevant instructional materials as possible to facilitate the retention. According to Stein and Bovalino (2001), using manipulative TLMs in teaching can be essential tools in assisting students to think and reason in more meaningful ways. To teach effectively, teachers must employ a variety of instructional strategies that encourage learners' participation and critical thinking. Effective teachers should be able to produce and use a variety of teaching and learning materials that enhance learning (T-TEL Professional Development Programme, 2016). Teaching becomes easier when appropriate teaching and learning materials are used (Mwonga and Wanyama, 2012).

2.1.2 Learning

Learning has no universally acceptable definition; and as a result, it has been variously described by varying theoretical viewpoints (Amissah, Oppong and Sam-Tagoe, 2009). As behaviourist, Marx (1971) as cited in Amissah and Sam-Tagoe (2002) define learning as comparatively a permanent change in behaviour which is the role of preceding behaviour or experience. Belonging to the cognitivist doctrine, Wittock (1977) as cited in Amissah and Sam-Tagoe (2002), describes learning as a process of attaining a relatively a permanent information, ability and skill through experience.

From both behaviourist and cognitivist tradition, learning is a permanent change in behaviour; and it is gained through experiences. Thus, prior learning experience is essential in acquiring the new experience (permanent change in behaviour). Learning is an experience acquired through adjustment. It is regarded as an active process but not a passive observation (Kundu and Tutoo, 2004). This implies that, for the learners to grasp

the learning experiences, they must be actively involved in the teaching and learning activities. To Smith (1999), learning is the accumulation of information that can be reproduced. In learning process, there is a link or interaction between the learner and environment that results in the attainment of the experiences. Without learning, teaching is bound to be purposeless.

In sum, the two concepts: teaching and learning work hand-in-hand, and there cannot be teaching without the intended learning. For the learning to be induced there should be a teacher and a learner. Teachers play an instrumental role in improving learning outcomes, and it is important that they become aware of the impact their practices has on student learning (Timperley, Wilson, Barrar, and Fung, 2007). Teaching and learning are processes, requiring that teachers engage learners in a series of activities intended to induce learning. Students learn primarily through interactions with people (teachers and peers) and instructional materials (Matthew and Grover, 2012). Learning is optimized when students construct their own understandings through using and refining concepts, principles, or propositions, rather than receiving them through direct instruction (Wisconsin Department of Public Instruction, 2013). Learners undertake learning experiences through the teaching and learning materials. These learning materials are crucial to the success of any teaching and learning process globally; because they facilitate the transfer of content to the learners effectively (Karaka, 2007).

2.2 What are TLMs?

Teaching and learning materials have been described in many ways by different authorities, but the emphasis has been on, "anything that helps teachers to transfer content effectively unto learners". Teaching and learning materials are aids used by teachers in facilitating lessons effectively. These materials are also used by learners to learn effectively. TLMs can be big or small; and can be purchased or made easily by both the facilitator and learners (Donald, Sonnile, and Nkosha, 2000). All materials and resources used for imparting the desired knowledge, skills, attitudes and values in learners are considered as teaching and learning materials (Simsek, 2003). According to Ikerionwu (2000), instructional materials are objects or things which enable the teacher to make learning meaningful to the learners. Instructional media involves all the materials and physical means a teacher might employ to implement instruction and facilitate achievement of instructional objectives. These include traditional materials such as chalkboards, handouts, charts, slides, overheads, real objects, and videotape or film, as well as newer materials and methods such as computers, DVDs, CD-ROMs, the internet, and interactive video conferencing (Scanlan, 2003). Instructional media are the range of materials that appeal to the five senses: seeing, hearing, touching, feeling and tasting, which enhance teaching and learning activities (Nyame-Kwarteng, 2006).

Teaching and Learning Materials also encompass any kind of materials used in teaching, including chalk, blackboard, paper, pens, books, bottle tops, everyday objects, technology of any kind, even natural or built-up environment, as well as our own body. Materials that can be handled or made by the students such as plastic bottles, beads, sticks and objects made by folding paper are termed manipulative (T-TEL Professional

Development Programme, 2016). Research indicates that using manipulative specifically is useful for teaching low achievers, students with learning disabilities, and English language learners (Marsh and Cooke, 1996; Ruzic and O'Connell, 2001). Every individual learns by receiving information through the sense organs, namely the eyes, ears, nose, tongue and skin (Nkuuhe, 1995 as cited in Anini, 2011). Instructional media ensure that the learners see, hear, feel, recognise and appreciate as they learn, utilising the five senses modalities at the same time (Lidia and Sara, 2010). Teaching and learning resources assist teachers to explain concepts easily to learners. When teaching a class with these resources, a few words are employed to present a given concept to learners. On the contrary, when a class is lacking these resources, the teacher strains in explaining concepts yet in vain (Omwoyo, 2003).

2.3 Benefits of Using TLMs in Lessons

Teaching and learning materials are essential part of many learning experiences. Education research in Ghana and across Sub-Sahara Africa indicates that TLMs are important part of a productive learning environment, and the use of these materials help students to learn better (T-TEL Professional Development Programme, 2016). Teaching materials can support student learning and increase student success (Guyana Ministry of Education, 2013). The purpose of using instructional materials is to promote effectiveness of education by improving the quality of teaching and learning. Integrating these materials provide support and reinforce teaching (Aduwa-Ogiegbaen and Imogie, 2005). Indeed, the benefits of using TLMs in lessons are enormous, and some are reviewed below:

Fidan (2008) asserts that teaching and learning materials make lessons more enjoyable, boost motivation and provide enduring learning process. They also help learners to learn new experiences and motivate them to like schooling. When children are exposed to various teaching and learning resources, they tend to be active and involved in the learning process (Rolleston, 2009). According to Kenya Ministry of Education (2010), teaching and learning material encourages understanding rather than rote learning. This implies that, when materials are brought in class: learners observe them closely, think critically and make sense out of the materials. Absence of these materials will mean that, students will focus solely on reading and memorizing information provided by the teacher.

To Montessori (1998), the use of concrete teaching and learning resources help in the development of five senses of the children. Learners can see, hear, smell, taste and touch or manipulate concrete materials to understand the concepts. This reduces the monotony of the teacher using only one material to enhance learning. The role of the teacher is to facilitate learning through the use of teaching and learning resources. Cornelius (1592-1670), an advocate of this principles said 'he who has seen a rhinoceros, even its pictures, can remember it more easily than if it had been described to him about 600 times' (Afful-Broni and Ziggah, 2007). This principle is in line with the Chinese proverb: 'I hear I forget; I see I remember; I do I understand'.

T-TEL Professional Development Programme for Tutors – Theme 5 (2016), acknowledges the essence of TLM in lessons, and outlines five benefits of using these materials:

i. **TLMs attract attention and interest of students:** TLM offers something new for students to see and touch. This makes classroom lively and active, and can add

variety and excitement to the subject. Students will learn better when they are motivated and interested.

ii. **TLMs clarify abstract ideas:** Teachers can illuminate abstract or conceptual subject matter more easily through a model or pictures/diagrams. Concretization of abstract concepts improves students' learning and understanding.

iii. **TLMs allow students to practice and apply new skills:** TLM that requires students to do something like playing game, making something or interacting with the environment; compel students to take new knowledge/skills and apply them. The process of "doing" as oppose to "memorizing facts", makes learning interesting and meaningful.

iv. **TLMs help students to remember more:** Every individual has a propensity of forgetfulness, yet the proper use of TLM aids students to retain content learnt by relating new ideas to their environment or through the memorable experience of "doing".

v. **TLMs make teachers' work easier:** Using TLM in lessons reduces teacher talk time, and allows students to do interactive and independent learning. TLM complements and reinforce content that teacher's provide and encourage healthy classroom environment.

In summary, TLMs make teaching and learning very interesting, interactive and motivating. The use of TLMs help students to relate abstract concepts to concrete object, which aids retention and understanding: making teaching and learning easy. Omwonyo (2003) affirms that teaching and learning resources enable the teacher to explain concepts easily to learners.

2.4 Theories on the Need for Teachers to Design Their Own TLMs

The selection of teaching and learning materials can have great or greater impact than the impact of teacher quality on students' performance (Grover, 2009). The materials used in lessons are most effective when they are at the appropriate level and relate closely to the topics of instruction. Low-cost teaching materials should be prioritized in order to ensure that all students have access to relevant materials (Hewlett Foundation, 2014; McEwan, 2013). Teachers therefore need to be equipped with knowledge and skills in TLMs selection, design and production; so that appropriate materials can be utilised in teaching and learning. The environment is richly endowed with material resources that could be used for improvisation (Koppett, 2001). Teachers need to harness the opportunity provided by the abundance of resources to produce variety of materials that can bring about concrete and meaningful learning (Osho, 2011). These materials can also be made available by parents and the community as a whole (Muithungu, 2003). Timperley et al (2007) emphasize the need to give teachers the authority to design their lesson plans in a way that fits their own teaching style and benefits the students. If teachers are capable of producing their own TLM, then their instructional materials would be appropriate for the intended lessons.

Guyana Ministry of Education (2013), asserts that teachers can make their own learning materials, and these materials can add important structure to lesson planning and the delivery of instruction. There are four main reasons why teacher should be able to design their own materials. These four themes were extracted from the literature works done by (Altan, 1995; Block, 1991; Harmer, 2001; Podromou, 2002). The following are the four major reasons why teachers must design their own TLMs:

i. Contextualization is one advantage of teacher-produced materials (Block, 1991). If teachers are able to design or adopt their own teaching and learning materials, they will take into account their learning environment so that the materials will fit the lesson objectives. On the contrary, commercial materials, especially those produced for the word-wide market may be generic and may not aim at specific group of learners or any particular cultural or educational context. Such materials may not be suitable for specific cultural or educational context. Globally designed materials (course book) stubbornly continue to be Anglo-centric (Atlan, 1995). These materials may not be appropriate in Ghanaian educational context.

ii. Teacher-made materials cater for individual needs of the learners. Teaching methodology today emphasizes on identifying and teaching to the individual needs of learners. If teachers are to produce their own TLMs, it will enable them cater for the individual needs of the pupils. In designing their own materials, teachers will be able to decide on which materials are appropriate for organizing learning experiences to benefit each individual. Accoring to Harmer (2001), "Most course books remain organized around grammar elements and PPP (presentation, practice, production) model of teaching, often unrelenting format which can be deeply unengaging" (p. 6). By producing their own TLM, teachers can develop variety of materials that fit their teaching style, and cater for the need of the particular learner.

iii. Teacher-designed material helps in personalisation of teaching and learning. Teacher made-materials add personal touch to teaching that students appreciate (Block, 1991). Taking into consideration the interest and the learning style of the students is likely to increase motivation and engagement in learning. Podromou

(2002) opines that there is a greater choice, freedom and capacity for spontaneity when teachers design their own materials. Teachers are flexible and are not bound to follow rigid steps or process if they develop their own materials.

iv. Finally, another advantage of teacher designed-material is timelines (Block, 1991). Teachers designing their own materials can respond to local and international events with up-to-date, relevant and high interest topics and tasks. In this case, the teachable moment can be seized.

In summary, teachers capable of designing their own TLMs are helped to contextualized learning, personalize or localize content to suit the individual needs of learners, and respond to current trend in teaching and learning. Though the organisation of materials and the cost, as well as the time are some challenges that teachers are bound to face in their efforts to design and produce their own materials. Yet, Guyana Ministry of Education (2013), affirms that every learning material that a teacher develops will be an asset to him the next time he will teach a similar unit. An investment of time or money in good teaching materials is an investment in good teaching. Teachers must therefore be encouraged to produce their own materials.

2.5 Curriculum and TLMs

Teaching and learning materials are very important in the successful completion of every curriculum. These materials are critical ingredients in learning and the intended curriculum cannot be easily implemented without them (The World Bank, A Chance to Learn, 2001). Teachers employ TLMs in their everyday lessons to achieve the learning objectives. Curriculum is negatively viewed as a syllabus which may confine the planning

of teachers to a deliberation of the content or the body of knowledge to be transmitted or a list of the subjects to be taught or both (Kelly, 1999). The balance between attention to context and attention to instruction has become a serious issue among education policymakers. Instructional interactions are the hubs of student learning but policymakers attend mostly to context (Grover, 2009). Initial observation of the researcher, as a tutor at St. Ambrose College of Education, Dormma-Akwamu revealed that, student- teachers on internship programme are very deficient in TLMs selection, design, production and utilization. Contrary, Hong Kong Yearbook (2006) posits curriculum as more positive in nature, which could achieve the objective of motivating learning; enhancing knowledge and abilities; and developing positive values or even attitudes. These elements could help achieve holistic development of students. For one to be sure that a given curriculum is a better choice than the other, he must know which students are being exposed to which instructional materials (Matthew and Grover, 2012). Curriculum is another focus of school reform activity. There is a shift to replace content driven curricula with relevant and applicable knowledge (Westbrook et- al, 2013).

Although many reform-based curricula are being developed, yet they have not been explicitly designed to support teachers' learning (White andFrederiksen, 1998). Curriculum for preparing teachers in Ghana has not shifted from the traditional content oriented style as reviewed in the subsequent topics. There is the need for curriculum planners to integrate skills development in TLMs selection, design, production and utilization; so that student-teachers could design their own TLMs for effective teaching and learning.

2.6 The Nature of the Curriculum for Colleges of Education in Ghana

Curriculum for teacher education is ideally aim at achieving quality instruction necessary to meet society's teacher demands and expectations. It therefore, seeks to propose a new direction in training basic school teachers, so that our children receive quality education. Currently, the curriculum for the 3-year Diploma in Basic Education focuses on training of a generalist teacher who would be able to teach at both Primary and J.H.S. levels. This implies that, in addition to courses in Education, Practical Activities and General Studies, students will be expected to take at least seven foundation subjects (English, Mathematics, Ghanaian Language and Culture, Integrated Science, Environmental and Social Studies, Pre-Vocational Skills and Religious and Moral Studies.

However, specialist training in Mathematics, Science and Technical Skills are offered by specific colleges of Education for trainees who are being prepared for the J.H.S level. French and Early childhood are also options offered by Specific Colleges of Education, and trainees taking these subjects are exempted from some of the foundation subjects. The content, methodology, professional and personal development courses therefore reflect the following generalist principles:

- Foundation courses covering all the subjects taught at the Primary and J.H.S. levels will be offered by students.
- Curriculum studies will cover both Primary and J.H.S. subjects.
- Courses in Methodology will cover Primary and J.H.S. teaching.

The curriculum is therefore intended to achieve the following objectives:

i. Produce generalist teachers capable of teaching all subjects at the Primary and J.H.S. levels.

ii. Produce specialist teachers capable of teaching specific subjects such as Mathematics, Science and Technical's at the JHS level, French at both Primary and JHS levels and Early Childhood Education

iii. Produce teachers who have a clear grasp of intended outcomes of their teaching activities, who are skilled in monitoring, diagnosing and appropriately providing equal opportunity to all pupils.

iv. Promote close working relationship between Colleges of Education and local schools through the "Out" component of the programme.

(University of Cape Coast, Three-Year Diploma in Basic Education Curriculum for Colleges of Education in Ghana, 2014)

A thorough study of the curriculum for Colleges of Education by the researcher reveals that, the aims, rationales and objectives of the syllabus are necessary in preparing quality teachers; yet, the content and learning experiences are not sufficient enough to equip student-teachers with requisite knowledge, skills and experiences needed to achieve objectives of the curriculum. Although most courses in the year two syllabus, like Principles and Methods of Teaching Visual Art, Child and Adolescent Development and Learning, Environmental and Social Studies 2, Educating the Individual with Special Needs, Methods of Teaching English (Primary), Methods of Teaching Integrated Science, and Methods of Teaching Primary and JHS Mathematics recognize the need for student-teachers to improvise, design and use TLMs in lessons. Unfortunately, no provision is made in the syllabus to equip student-teachers with the skills in TLMs design and production; and also there are no tutorial demands on the part of College of Education Tutors. The only course which strives to address this problem superficially is the Principle

and Method of Teaching in Basic School, which teaches the student-teachers the meaning of instructional materials and improvisation, types of instructional materials and essence of using these materials in lessons. The associated pitfall is that, student-teachers are not equipped with the requisite skills for design and production of teaching and learning materials. In addition to this, Methods of Teaching Primary and JHS Mathematics also attempt to compel student-teachers to improvise but since they lack basic skills in TLMs design and production, their efforts become futile.

2.7 The Scope of Visual Arts Programme in the Collages of Education

Visual Arts programme is based on the Theory of learning by understanding, not rote learning. As a result, practical problem solving methods should be adopted in teaching it. Emphasis must be placed on the acquisition and application, the cognitive skills (education of the head), psychomotor skills (education of the hand) and affective skills (education of the heart). In the first year (first semester), all the first year students must pursue a course in visual art, known as Fundamentals in Visual Art. In the second year, student-teachers can opt for Visual Art as an elective course, which is a two-semester programme. In year-two first semester, all Elective Visual Art students are taught Principles and Methods of Teaching Visual Art; while in the second semester, student-teachers must select one course from the following discreet areas in visual Art:

- Assemblage and Construction
- Fabric and Leather Decoration
- Modelling, Casting and Carving
- Visual Communication
- Weaving and stitching

Table 1: The Structure of the Visual Art Course in Colleges of Education in Ghana

Year	Course	Semester	Credit
One	(FVA 111) Fundamentals in Visual Arts (*General Course)*	One	1
Two	(FVA 211) Principles and Methods of Teaching Visual Arts *(Elective)*	One	1
Two	FVA 221 Assemblage and Construction *(Elective)*	Two	1
Two	FVA 222 Fabric and Leather Decoration *(Elective)*	Two	1
Two	FVA 223 Modelling, Casting and Carving **(Elective)**	Two	1
Two	FVA 224 Visual Communication **(Elective)**	Two	1
Two	FVA 225 Weaving and Stitching **(Elective)**	Two	1
	***Choose ONE course in Year 2, Semester 2**		

(University of Cape Coast, Three-Year Diploma in Basic Education Curriculum for Colleges of Education in Ghana, 2014)

2.7.1 The Nature of the Course, Fundamentals in Visual Arts (FVA111)

As a foundation course in vocational skills – Visual Arts, upon completion the learning experiences in the first year (first semester), the student-teachers are expected to demonstrate:

- Understanding of the nature and scope of Visual Arts
- Knowledge in basic concepts and practical skills in Fundamentals in Visual Arts

Table 2: Content of Fundamentals in Visual Art (FVA111) As a General Course in Colleges of Education in Ghana

Unit	Topic	Sub Topics
1	Nature and scope of the Visual Arts	• Visual Arts comprises of visual art options in creative arts and basic design and technology • The scope covers pre-disposition (introduction) to basic Visual arts subjects.
2	Basic Design	• Concept, scope and explanation • Identification of elements of design- dot, line, shape, space, texture, colour, plane weight and volume • Classification of elements of design – Natural Elements and Man-made Elements • Creating elements by drawing, spraying and printing • Identification of principles of design – unity, variety, harmony, contrast, repetition, dominance, opposition, scale, proportion and rhythm. • Classification of principles of design- Natural and Man-made principles of design • Creating the principles by drawing, spraying and printing
3	Colour work	• Concepts of colour: The spectrum (experiment with water and mirror) • Ghanain concept of colour- deriving colour from nature eg. Lemon-yellow colour • Colour wheel – six- point colour wheel, twelve-point colour wheel, Colour terminologies, color interactions • Colour Symbolism – Univeral colour symbolism, Ghanaian colour symbolism

4	Drawing	• Drawing Techniques • Drawing Tools and Materials (identification, exploration) • Outline Drawing • Drawing and shading by vertical lines, diagonal lines, dots, hatching, cross hatching and mass • Perspective: One-point perspective, Two-points perspective
5	Pattern / Printmaking	• Scribbling (doodling, frottage printing) • Block Printing, Stencil Printing • Motif Design and Arrangement
6	Perception	• Concepts of perception • The six human sense organs and the sense • Perceiving with the senses
7	Creativity	• Concept of creativity • Qualities of a Creative Person • The Creative Environment • The Creative Product
8	Lettering	• Freehand Lettering • Block Lettering- Roman Lettering • Freestyle Lettering • Calligraphy

(University of Cape Coast, Three-Year Diploma in Basic Education Curriculum for Colleges of Education in Ghana, 2014).

From table 2, the course, Fundamentals in Visual Arts (FVA 111), is a general programme which is studied by the entire first year student-teachers. This course seeks to

provide the foundation for the study of Vocational Skills-Visual Arts in the Diploma Programme. It covers basic concepts common to all visual arts subjects to equip generalist teacher trainee a broad based education.

Ideally, considering the scope of this course, one would have thought that, the student-teachers should attain the basic skills in design and production; but the situation is different on the field. Per the researcher's personal observations and experiences, the time allocation for this course is not enough for learners to undergo the expected learning experiences. As a result, the focus of the student-teachers is geared towards passing the external examination conducted by the Institute of Education, University of Cape Coast. Another shortcoming observed is that, the course content does not inculcate in the student-teachers the knowledge and skills in TLMs selection, design, production and utilization which is very essential in teaching and learning as discussed earlier in sub-heading, '2.4 Theories on the Need for Teachers to Design and Produce Their Own TLMs'.

Amenuke, (1995) agrees that inculcating design skills unto student-teachers, at colleges of education is very crucial because it helps them develop initiative and capability skills to plan and implement their own projects. This helps to develop cognitive, psychomotor, emotional and aesthetic skills of student-teachers. Technologically, Ghana cannot be creative if serious attention is not paid to the concept of Design and Technology Education. These are basic or fundamental skills required for industrial growth and development of the country.

2.8 Product Design (Design Process)

Design is a plan within the work of art. It is the organization, arrangement or composition of a work of art. In this regard, design is considered as a process or as the result of a process (Amenuke, et-al, 1993). Odame and Obiri-Yeboah (2011) see deign as organised arrangement of one or more elements and principles for a purpose. To them, awareness of elements and principles of design is the first step in creating successful art work. Design is not a mere orgnisation of elements; rather, the arrangement of elements (such, as dot, line, colour, texture, shape etc.) should be guided by certain principles (such as unity, harmony, variety, contrast, rhythm, etc). This implies that, design is a process and it requires careful planning.

Amuneke (1995) asserts that the design process begins with a problem. "Instead of confronting students with specification or measurements to produce article, it is more creative to pose him with a problem". He further describes nine stages in designing as follows:

1. **The problem:** Identify the problem, thus the need for the product (example, a container- basket, bag, pot, etc.)
2. **Define and specify the problem:** Brief description of item to be produced. For example, a strong basket is needed to carry cocoa pods in the farm or tomatoes to the market.
3. **Investigate the Problem (Research and Analysis):** Research is conducted to generate idea for the product. Consider the uses (function) of the product; determine the size, shape/form of the product; select appropriate tools and material for the product; consider the making techniques and aesthetic qualities; consider cultural

elements, designs and symbols; consider the cost of the article as well as the market value.

4. **Suggest Possible Solutions:** Study objects in the environment and derive ideas from shapes, pattern, texture, colour, etc. Make free-hand drawings of possible shapes. Redesign the shapes until the most suitable is attained. Consider how design elements (example shapes, colour, texture, etc) would be organised in accordance with certain principles (example rhythm, unity, balance, proportion, etc.) for effective article. Select appropriate materials for the article.
5. **Model (if necessary):** Make a sketch model from the shape designed using a suitable material – paper, clay, wood, straw, etc.
6. **Prototype:** Make a prototype article in a suitable material that can function like the final article. In art, this prototype may be the final article; but in technological context, further designing may be necessary.
7. **Working drawings:** For industrial related products, working drawings are required for mass production. Draw the prototype to article to technical scale.
8. **Production (Making the article):** This involves using the appropriate tools, materials, and techniques to produce the final article. Here is where skills in technology or processes are applicable.
9. **Appraisal:** Trial-test the article to see if it can serve it purpose. Evaluate the article critically against it purpose, function, suitability, craftsmanship, cost, aesthetic values, etc. If there are defects, make corrections.

Wisconsin Department of Public Instruction, (2013) identifies the following as stages in designing.

1. **Identify and Define Problem:** Indicate the need for the idea/product and describe briefly the nature of the item/idea.
2. **Brainstorm, Research, and Generate Ideas:** Conduct research to gain ideas for the solution of the problem, and think through ideas generated.
3. **Determine Criteria for Solutions:** Set out standard or criterion to measure the intended idea/product.
4. **Explore Possible Solutions:** Try out as many as possible solutions
5. **Select Appropriate Solution:** Choose the right and suitable idea/item to solve the problem
6. **Create and Implement Solutions:** Make the idea/product to solve the problem
7. **Test Solutions and Evaluate, Reflect, Redefine, and Rework:** Test the idea/product if it is appropriate or suitable. Think through and identify strengths/weaknesses and rectify errors if any. It should be noted that, in practice, the design process might prove to be non-linear, circular, and/or repetitive. In designing, one idea leads to another, therefore each step connect to the other. To design and produce teaching and learning materials, design process is applicable.

2.9 Making TLMs Using Design Process

The first stage in design process is the identification of the problem (Amenuke, 1995), and therefore the first stage in making teaching and learning materials is to identify the need of the material in lesson. The design process proposed by Amenuke (1995) is adopted in this study to serve as a guide in making teaching and learning materials.

a) **The problem:** Identify the need for the materials. TLMs are developed to suit the objective of teaching and learning effectively. They help learners to think about information in different ways, as well as ensuring active participation. These materials help learners to connect and relate what is being taught or abstract concepts to real life situations **(**Donald et-al, 200). Hence, teaching and learning cannot do without TLMs.

b) **Define and specify the problem:** What kind of materials do you need to accomplish objectives of your lesson? TLMs are of different kinds ranging from traditional materials such as chalkboards, handouts, charts, slides, real objects, and videotape or film, as well newer materials and methods such as computers, DVDs, CD-ROMs, the Internet, and interactive video conferencing (Scanlan, 2003). Nacino-Brown, Oke and Desmond, (1982) classify instructional materials into four broad headings: audio, visual, audio visual and community resources. Knowing the types of TLMs, the user, length of lesson and the method to be used to deliver the lesson effectively will make it easy for you to decide the type and size of TLMs you need to design **(**Donald et-al, 2000).

c) **Investigate the Problem (Research and Analysis):** Conduct research to know the nature of the material to be produced. To develop TLMs you need to choose a topic, make a plan and identify the resources available. Identify the local resources (which can be free or obtained at low cost) that would determine what kind of material should be developed. **(**Donald et-al, 2000). Oppong et-al, (2009) suggest that, TLMs should be appropriate to achieve lesson objective; they should be suitable for intended learners; they should be physically attractive, authentic, accurate and easy

to be handled; the cost involved in acquiring the materials should be within the limit of the school budget; and finally, the materials should be able to convey understanding to the learners within the time allocated for the lesson. If student-teachers are acquainted with this information, they would be able to select, design and produce appropriate TLMs for effective lessons.

d) **Suggest Possible Solutions:** Based on your investigations, which resources in your environment are suitable for the intended TLMs. Explore many local materials in order to attain appropriate one for your design. Derive ideas from shapes, pattern, textures or colours in your environment. Make free-hand drawings of possible shapes or form of your TLMs. Redesign the shapes or form until the most suitable is attained. Consider how design elements are organised in accordance with design principles to make your TLM attractive. Select appropriate materials for the article.

e) **Prototype:** Make a prototype TLM in a suitable material that can function like the final article. If you are to produce only one TLM, this prototype may be the final work; but if you are to produce more of such TLMs, further designing may be necessary.

f) **Working drawings:** For mass production, working drawings are required. Draw the prototype of your TLM to technical scale. Create various pattern/part for final production.

g) **Production (Making the article):** This involves using the appropriate tools, materials, and techniques to produce the final TLMs. Here is where skills in technology or processes are applicable.

h) **Appraisal (Evaluation):** Trial-test the TLM to see if it is appropriate for the intended purpose. Assessment of TLMs could be done in a short classroom conferences or discussion. Teachers should gain confidence in their TLMs, and accept review comments from their colleague teachers. Utilize the TLMs in the actual teaching and learning session with an actual group of learners (Donald et-al, 2000). Critically evaluate your material against its purpose, suitability, craftsmanship, aesthetics and cost of production. If there are defects, make modifications (Amenuke 1995).

2.10 Characteristics of Good TLMs

T-TEL Professional Development Programme for Tutors – Theme 5 (2016), outlines the following characteristics of good TLMs.

- The TLM must be relevant and assist in the realization of learning objectives.
- The TLM must be used strategically within a game or activity to encourage participation and interactive learning. Thus, merely showing of objects or maps to pupils will not enhance learning in itself, rather integrating the TLM in game or learning activity will improve learning.
- The TLM must be prepared and planned in advance.
- The TLM must be accessed (seen or used) equally by all pupils in the class.
- The TLM must be interesting, informative and accurate.
- The TLM must be gender responsive – it does not reinforce traditional gender roles or stereotypes.

2.11 General Guidelines on Using TLMs in Lessons

Understanding and application of appropriate methodologies enable the teacher to use teaching and learning materials in an effective manner which benefits the individual learners in the classroom. Teaching and learning materials become useless when teachers use them inappropriately (Barbosa, 2005). According to Oppong et-al, (2009) the selection, utilization and evaluation of teaching and learning materials are very essential because they are not ends in themselves but means to an end. Based on this, the selection, utilization and evaluation of TLMs require professional skills which can only be attained through training and practice. Donald, et-al (200) outlines the following strategies for effective use of teaching and learning materials.

- Develop TLMs to suit the objective of the lesson
- Identify the target audience or learners and involve them in the planning and developing TLMs
- The learners must be able to manipulate the TLMs themselves.
- Teachers should use variety or wide range of TLMs.
- Teachers should employ teaching and learning activities that lead to the achievement of the lesson objective (s).
- Teaching and learning materials must be fully utilized in lessons.
- Familiarize yourself with TLMs to suit the learners' ability, background and classroom situation. This will help the facilitator to gain confidence on the use of the TLMs.
- Learners too must be familiar with the TLMs
- TLMs should be easy to carry or portable

- Use TLMs in the actual teaching and learning session with actual group of learners to enable the teacher update or revise the materials.
- Facilitators should accept review comment on TLMs from their colleagues.
- Incorporate two or more teaching methodologies or approaches into the design and use of TLMs.
- The learners should be able to decide which TLMs to use for which learning strand or aspect. Every learning strand or aspect should have relevant TLMs.
- Evaluate and Revise TLMs after lesson.
- Effective TLMs should be appropriate, attractive, manipulative, seen, or heard.

Teaching and learning materials must be properly cared for. Caring for TLMs means, looking after TLMs properly before something untoward happen to them (Donald et-al, 2000). To them, Taking good care of TLMs includes the following practices:

- Keep books in cupboards after use
- Wash hands before handling books
- Avoid putting inks in books
- Avoid use of books near or while handling food
- Store TLMs correctly, for example materials that need to be kept upright or rolled up must be treated as such.
- Keep TLMs away from sources of water, example leaking roof.

2.12 Theoretical and Conceptual Framework

The theoretical and conceptual framework for this study is based on the discussions presented in the literature review. The foundation for the study stems from the three key concepts in the topic under study, and these are:

- Teaching
- Learning and
- Teaching and Learning Materials

These concepts are highly supported by John Dewey's Theory of Experiential Learning Cycle in the 20th century; which emphasized on acquisition and manipulation. Dewey stressed the importance of experience in education: "there is an intimate and necessary relation between the processes of actual experience and education" (Dewey, 1938: 7). His ideas are a backlash against a passive, teacher-focused approach, including traditional classroom teaching methods such as rote memorization. For Dewey, knowledge is not information transferred to students for future use, but instead knowledge is the understanding based on past and current experiences, used constantly to test previous conceptions and inform new practices (Roberts, 2003). According to Dewey, "Education must be conceived as a continuing reconstruction of experience…. the process and goal of education is one and the same thing" (Dewy, 1897: 79). In 1946, Kurt Lewin revised Dewey's ideas and schematized it in a diagram and named it as Lewinian Learning Cycle. Based on Dewey's work, and other notable theorists such as Kurt Lewin, Jean Piaget, Carl Rogers, and William James, Experiential Learning Theory emerged (Kolb and Kolb, 2005). Kolb (1984) revised Lewinian Learning Cycle and renamed it as Experiential Learning Cycle (Arsoy and Ozad, 2014).

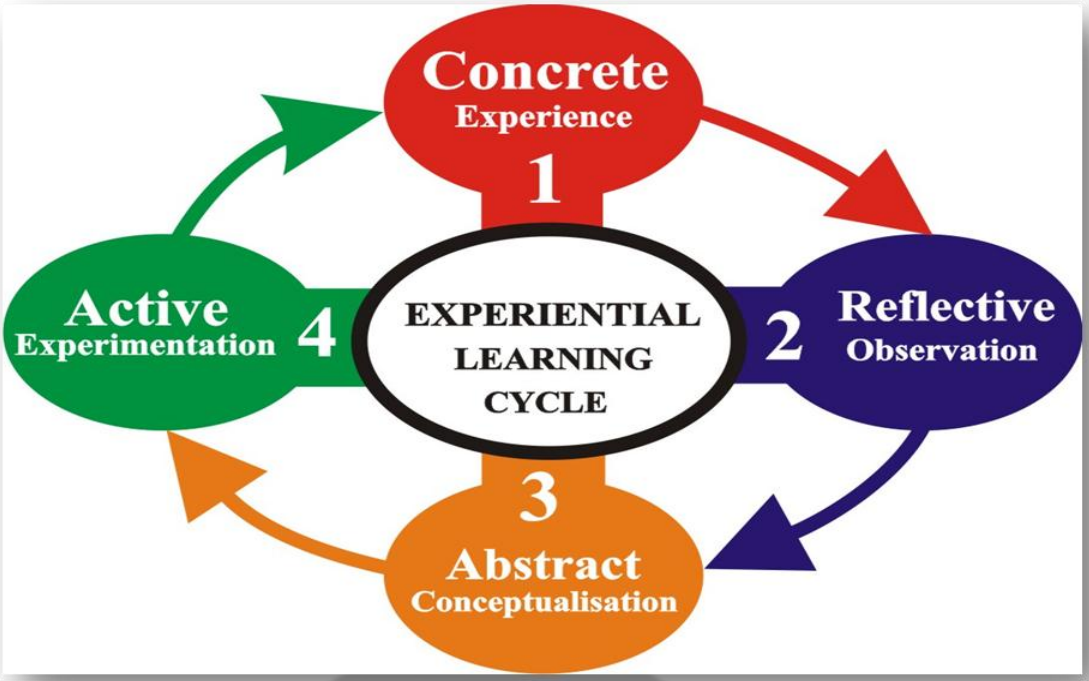

Plate 1: The Experiential Learning Cycle (Kolb, 1984)

Learning by doing is a key concept in Experiential Learning Cycle. The central tenet is that "learning is the process whereby knowledge is created through the transformation of experience, and Knowledge results from a combination of grasping and transforming experience" (Kolb, 1984: 41). Experiential learning can be conceptualized as a process with several components: students have an experience (Concrete Experience), reflect on observations about that experience (Reflective Observation), analyze responses and formulate new ideas (Abstract Conceptualization), and then actively test these new ideas in new situations (Active Experimentation). This process is a continual cycle, with increasing complexity (Kolb and Kolb, 2005). Kolb suggests that previous experiences, hereditary characteristics, and current environment together drive development of a preferred way of grasping and processing experiences. The combination of these preferred

methods contributes to specific learning styles, such as initiating, experiencing, imagining, reflecting, analyzing, thinking, deciding, acting and balancing. Students' learning styles have been assessed by using the Learning Style Inventory (Kolb and Kolb, 2005).

In summary, experiential learning is a teaching technique where learners are educated through interaction with concrete materials to gain first-hand experience. The desired skills knowledge, experience and attitude are acquired by manipulations and interactions with teaching and learning materials. The experiential learning cycle stems on three key components: concrete experience, reflective observation, abstract conceptualization and active experimentation. If appropriate TLMs are designed and used effectively in lessons, pupils would be able to concretize learning, reflect on what they observe, conceptualize them and carry out experiment to verify their understanding.

CHAPTER THREE

METHODOLOGY

3.0 Overview

This chapter specifies the procedures or methods used to conduct the study. It contains the research design, population, sample and sampling techniques, data collection instruments, data collection procedures and data analysis plan. It also presents the general procedures adopted for design and production of teaching and learning materials. Thus, pre-intervention, intervention and post-intervention processes are presented chronologically.

3.1 Research Design

The research design used in this study is qualitative, and the main research method employed in conducting the study is action research.

3.1.1 Qualitative Research Design

This approach focuses on subjective meanings, definitions, symbols and descriptions of specific cases. Berg (2007) asserts that qualitative research refers to the subjective meanings, concepts, definitions, characteristics, metaphors, symbols and description of things. In this approach data is collected in form of words, sentences or statements rather than numbers. Qualitative research is an interpretative and subjective exercise, and the researcher is closely involved in the process, not aloof from it (Pope and Mays, 2006). Leedy and Ormrod (2005) indicate that qualitative research seeks to understand the human and social behaviour from the participants' point of view which

could be in the social setting such as a community, school or institution. This approach is appropriate for the study because it is concerned with phenomenon relating to quality or kind but not quantity.

3.1.2 Action Research

This kind of research seeks to generate knowledge, suggest and implement change, and improve practice and performance (Stringer, 2000). Action research in education is the process of studying a school situation to understand and improve the quality of the educative process (Johnson, 2012). In action research, the researcher works collaboratively with other people to solve a perceived problem. The stages in action research include: pre-intervention, intervention and post intervention (UCC-Institute of Education, 2013). Action research is appropriate for this study because it provides practitioners with new knowledge and understanding about how to improve educational practices or resolve significant problems in classrooms and schools (Mills, 2011 and Stringer, 2008). Johnson (2012) asserts that action research bridges the gap between research and practice. Some downsides of action research include fieldwork, which requires that the data must be collected by the researcher himself. It is also costly and time consuming. Again it is not appropriate for large population.

3.2 Population

Population refers to the aggregate or totality of all the objects, subjects or members that conform to a set of specifications (Polit and Hungler, 1999). The target population for the study was about 360 student-teachers which constituted the entire student population of St. Ambrose College of Education-Dormaa Akwamu as shown in table 3.

Table 3: Population for the Study

Year / Level	Number of Student-Teachers	Percentages
Year One	168	47
Year Two	162	45
Year Three	30	8
Total	**360**	**100**

From table 3, the population for the study was the entire student population of St. Ambrose College of Education, Dormmaa-Akwamu. As pertained to colleges of education, the 168 and 162 year one and two student-teachers respectively stay on campus, while the remaining 30 year-three student-teachers stay off-campus for practicum. The population accessible for the study was ninety (90) student-teachers, consisting of sixty (60) second year visual art student-teachers and the entire thirty (30) final year student-teachers on practicum as shown in table 4.

Table 4: Accessible Population

Cohort	Number of Students	Percentages
Year-Two Visual Art Students	60	67
Year-Three Students on Practicum	30	33
Total	**90**	**100**

From table 4, 60 visual arts students and 30 students on practicum were accessible population which constitutes twenty five percent (25%) of the entire population.

3.3 Sampling Techniques

Sample is a portion of a population or universe (Tailor, 2005). The process of selecting a portion of the population to represent the entire population is known as sampling (Polit and Hungler, 1999). The study employed purposive and convenience sampling techniques, which are non-probability sampling techniques. This implies that not every element of the population has an opportunity of being included in the sample (Burns and Grove, 2001). Purposive sampling is a sampling technique where a unit of the population that meets the requirement of a particular study or research is selected for data collection (Wiersma and Jurs, 2009). Purposive sampling was used to reach 30 student-teachers who were undertaking their internship programme (off campus teaching practice). These student-teachers were deemed to possess the needed data for the study. Convenience sampling also refers to the researching subjects of the population that are easily accessible

to the researcher (Kristie and Lisa, 2008). This technique was used to reach 60 visual art students who were easily accessible in the college.

3.4 Data Collection Instruments

Participant observation and one-on-one interview were employed as data collection instruments in this study because they are envisaged to furnish the researcher with accurate and reliable data to gain deep understanding of the problem. These instruments serve as pre-intervention procedures in this study.

3.4.1 Pre-Intervention Process

Pre-intervention is the procedure that the researcher adopts in trying to define or diagnose the perceived problem before the actual intervention. Instrument such as observation, face-to-face interviews, questionnaires and test may help in diagnosing the problem which must surely suggest an intervention (Institute of Education- University of Cape Coast, 2013). The study employed observation and face-to-face interviews for the pre-intervention procedures. The pre-intervention in this study means diagnosing student-teachers challenges on TLMs selection, design, production and utilization; to enable the researcher suggests intervention procedures to equip student-teachers with requisite knowledge and skills for effective selection, design, production and use of TLMs in lessons. Thus, student-teachers on the practicum were critically observed during lessons to diagnose their challenges on selection, design, production and use of TLMs. They were further interviewed in order to deeply understand their challenges and how they could be helped to overcome them.

3.4.2 Observation

Observation is a technique that involves systematically selecting, watching and recording behavior and characteristics of living beings, objects or phenomena. Participant observation is the process enabling researchers to learn about the activities of the people under study in the natural setting through observing and participating in those activities (Kongmany, 2009). The student-teachers on internship programme were observed closely during lessons in order to ascertain if their TLMs were appropriate, suitable, attractive, interactive, durable and effective for lessons. The findings yielded by this observation were incorporated into the training intended to equip student-teachers with requisite knowledge and skills for TLMs selection, design, production and utilization. Participant observation was conducted to acquire first hand information that is accurate and reliable, without relying on reports. Other advantages of observation include: the offering of data when respondents are unable and/or unwilling to offer, and also it approaches reality in its natural structure and studies as they evolve (Institute of Education, -UCC, 2005). Bias and time constraints are major downsides of observation.

3.4.3 Interview

An interview is a data-collection technique that involves oral questioning of respondents, either individually or as a group (Kongmany, 2009). Interviews are particularly useful for getting the story behind a participant's experiences (McNamara, 1999). In-depth (personal) interview was conducted to gain deep understanding of inability of student-teachers to design appropriate TLMs. The focus of the interview was to find out challenges/difficulties that student-teachers encounters in designing their own TLMs, so as

to device appropriate interventions to address them. Weaknesses associated with interviews include: liable to bias, time consuming, very expensive and intrusive to the respondent.

3.4.4 Validity of Instruments

Validity is defined as a measure of truth or falsity of the data obtained through using the research instrument (Burns and Grove, 2001). The research instruments, observation and personal interviews provide first hand information which is highly reliable. It is the researcher's responsibility to take precautionary measures to confirm areas of validity within his/her research (Strauss and Corbin, 2008). In order to obtain authentic data, salient questions were repeated in both observation and interview guides. In this case data furnished by one instrument can be checked or validated by the other. Also, if one of the instruments fails to capture pertinent data, the other will surely capture it. For instance, if the respondents are unwilling to disclose certain information during interviews, the personal observation will uncover them, and vice-versa.

3.5 Data Collection Procedures

The study is a fieldwork; therefore the data was collected by the researcher himself as follows: The third year student-teachers on internship programme were observed during lessons, to find out if their TLMs were appropriate, suitable, durable, flexible, interactive and attractive for effective lessons. The focus of the observation was to study the nature of the TLMs used, how the student-teachers integrate the TLMs into their lesson plans and the overall effect of the TLMs on their lessons. At the end of every lesson, student-teachers critiqued their TLMs through personal interview, so as to identify faults and suggest ways

in which they could be helped to design better ones. The responses of these personal observations and interviews were recorded in form of text and pictures. These findings were factored into the workshop intended to equip trainees with requisite knowledge and skills in TLMs selection, design, production and utilization.

3.5.1 Intervention Procedures

The intervention is a series of concrete measures, approaches or methods put in place by the researcher to solve a specific problem (Institute of Education-UCC, 2013). The intervention procedures involved two main stages, and each phase or stage consists of series of activities, of which the details and final results are shown in chapter four.

- ***Stage One: Basic Drawing and Lettering Session***

Student-teachers were taken through basic drawing and lettering skills, which manifested as major skills that student-teachers lacked, based on researcher's personal observation.

Activity One

Topic: Drawing- basic drawing, shading and Coloring

Tools and Materials Used: Sketch pad, pencil, pen and crayon.

Teaching Methodology: Demonstration

Session Objectives: By the end of the session, the trainee will be able to draw simple geometric (regular) shapes and organic (irregular) shapes, and shade them properly.

Teaching Procedures:

i. The researcher made trainees aware that, to draw anything, one must critically study the object by observing its shape, form, size, texture and colour.

ii. The researcher guided trainees to draw geometric (regular) shapes such as circle, square, cube, cone, cylinder, triangle, rectangle and cone, as shown in plate 2.

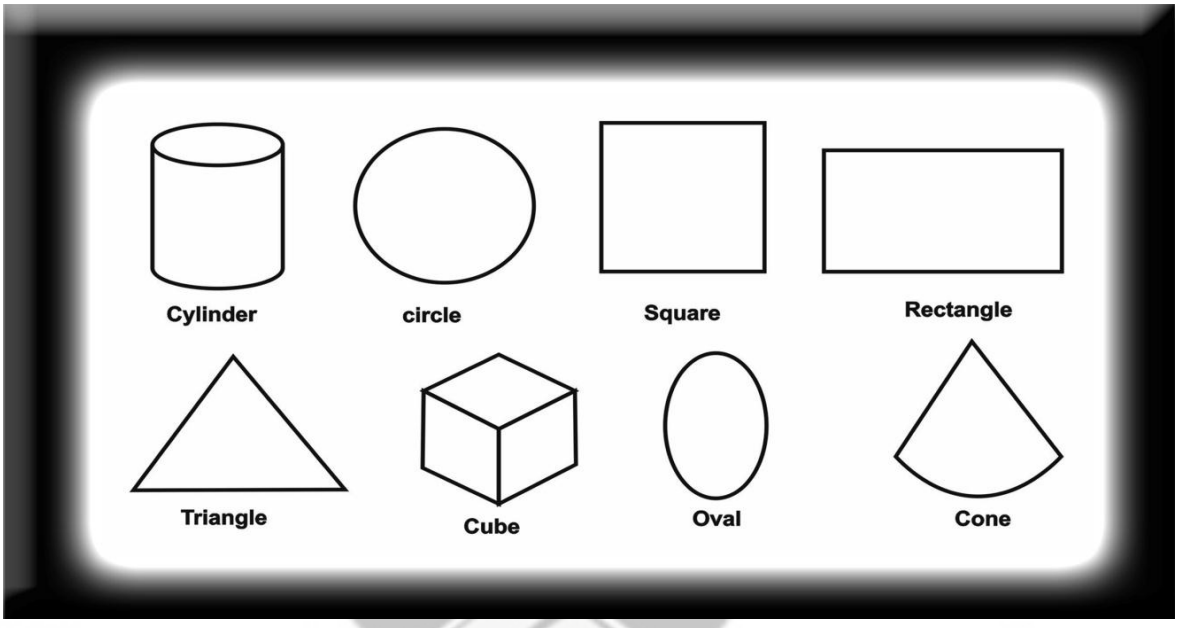

Plate 2: *Geometric (regular) shapes*

iii. The researcher guided trainees to draw organic shapes such as flowers, fruits, leaves, animals or plants, as shown in plate 3.

Plate 3: *Some organic (irregular) shapes drawn*

iv. The researcher guided the trainees to change basic shapes into form by applying shading techniques such as shading by diagonal lines, shading by vertical lines, hatching, cross hatching, pointillism and mass shading, as shown in plate 4.

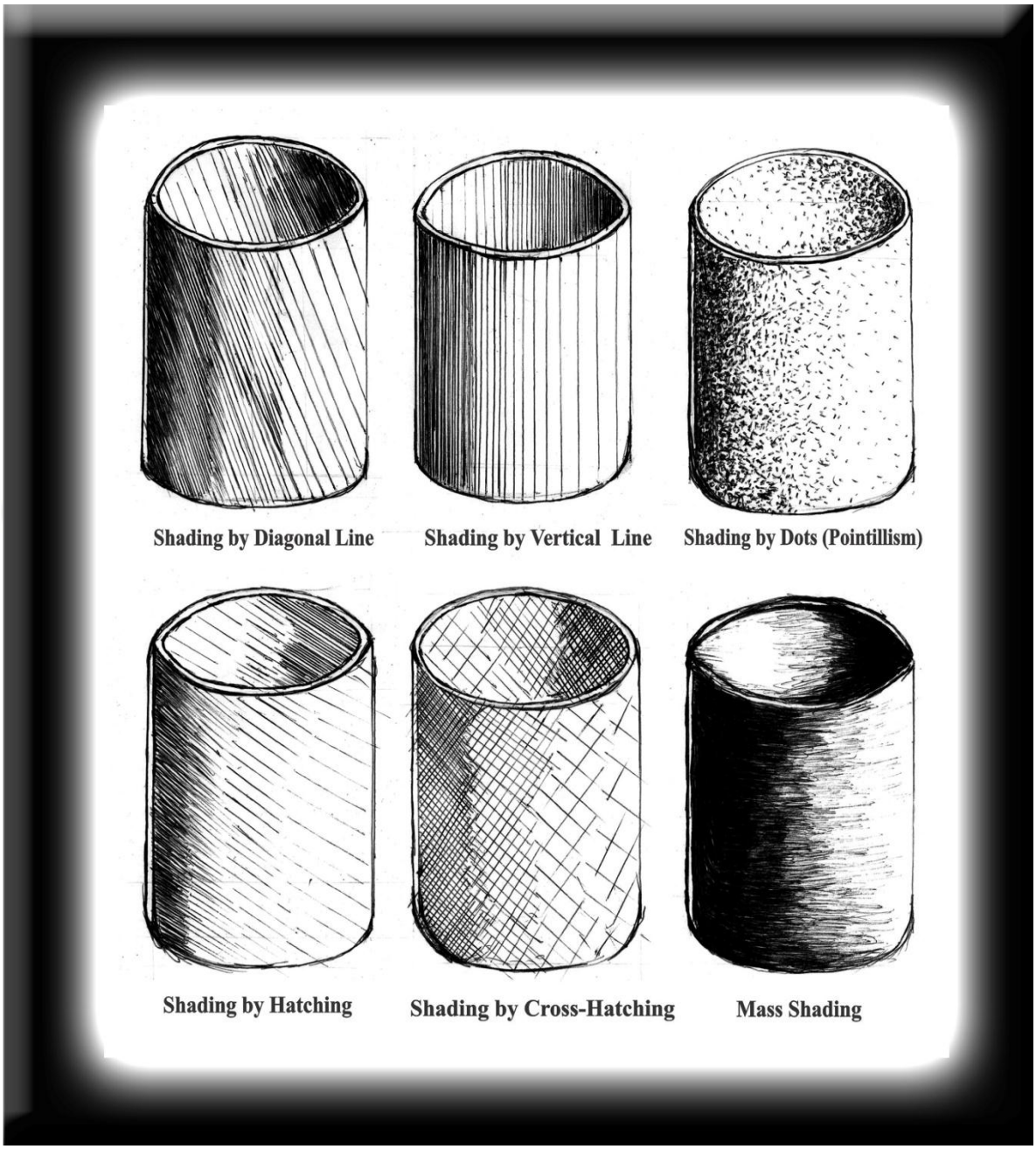

Plate 4: *Some shading techniques*

Plate 5: *Some student-teachers at basic drawing session*

Activities Two

Topic: Lettering

Tools and Materials Used: Sketch Pad, pencils, crayon and ink.

Teaching Methodology: Demonstration

Session Objective: By the end of the session, the participants will be able to write letters, words and simple sentences in freehand lettering.

Teaching procedures:

i. The researcher guided trainees to write upper case letters (A-Z) in freehand; by first drawing three horizontal lines as guidelines. The middle line should divide the height of the letter into two equal parts as shown in plate 6.

ii. Trainees were guided to write headings in uppercase letters using freehand.

Plate 6: *Freehand lettering (upper case)*

iii. The trainees were guided to write lower case letters (a-z) in freehand by first constructing four guide lines namely ascender line, median line, base line and descender line as shown in plate 7.

iv. Trainees were made to understand that, lower case letters are grouped into three: the x-height (a, c, e, m, n, o, r, s, u, v, w, x and z), the ascenders (b, d, f, h, i, l, and t) and descenders (g, j, p, q, and y).

Plate 7: *Freehand lettering (lower case)*

v. Trainees were asked to write lower case letters in such a way that x-height letters must touch the base line and median line; ascenders must touch the ascender line; and descenders must touch the descender line as shown in plate 8.

vi. Trainees were then guided to write sentence in lower case.

Plate 8: *Parts of freehand lettering (lower Case)*

Plate 9: *Student-teachers at freehand lettering session*

- ***Stage Two: Training Student-teachers on TLMs Design and Production***

In training the student-teachers on TLMs design and production, specific subjects and topics were selected, because of limited resources and time. Mathematics, Science and Creative Arts were selected for the study. Per the researcher's personal observation, mathematics and science are difficult to teach and learn at basic levels; therefore if

manipulative TLMs are available, it would make them easy for both teachers and pupils. Creative Art was selected because none of the thirty students observed taught it. The researcher believes that, if student-teachers are trained how to produce manipulative TLMs, it would help to motivate them to teach Creative Arts in basic schools. The table 3, below shows the subjects selected for the study; the specific Topic/TLMs produced and justifications for which those TLMs were produced.

Table 5: Selected Subjects for the Study and the Reasons for Producing the TLMs

Subject	TLMs / Topic	Reasons
Mathematics	1. Counting Tray	To provide support for counting
	2. Counting Materials	To teach counting/addition/subtraction
Science	1. The Solar System	To teach the topic 'the solar system'
	2. The Human Digestive System	To teach Digestion System in Human
Creative Arts	1. The 12-Point Colour Wheel	To teach Clour Work
	2 Pattern Making Cards	To teach pattern design and making

General Procedures for Making the TLMs

The first stage in design process is the identification of the problem (Amenuke, 1995), and therefore the first stage in making teaching and learning materials is to identify the need of the material in lesson. The design process proposed by Amenuke (1995) was adopted in this study to serve as a guide in making teaching and learning materials.

1. The problem: Identify the need for the materials. TLMs are developed to suit the objective of teaching and learning effectively. They help learners to think about information in different ways, as well as ensuring active participation. These

materials help learners to connect and relate what is being taught or abstract concepts to real life situations (Chand et-al, 200). Hence, teaching and learning cannot do without TLMs.

2. Define and specify the problem: What kind of materials do you need to accomplish objectives of your lesson? TLMs are of different kinds ranging from traditional materials such as chalkboards, handouts, charts, slides, real objects, and videotape or film, as well as newer materials and methods such as computers, DVDs, CD-ROMs, the internet, and interactive video conferencing (Scanlan, 2003). Nacino-Brown, Oke and Desmond, (1982) classify instructional materials into four broad headings: audio, visual, audio visual and community resources. Knowing the types of TLMs, the user, length of lesson and the method to be used to deliver the lesson effectively will make it easy for you to decide the type and size of TLMs you need to design (Chand et-al, 2000).
3. Investigate the Problem (Research and Analysis): Conduct research to know the nature of the material to be produced. To develop TLMs you need to choose a topic, make a plan and identify the resources available. Identify the local resources (which can be free or obtained at low cost) that would determine what kind of material should be developed. (Chand et-al, 2000). Oppong, Amissah, Asemanyi and Ziggah (2009) suggest that, TLMs should be appropriate to achieve lesson objective; they should be suitable for intended learners; they should be physically attractive, authentic, accurate and easy to be handled; the cost involved in acquiring the materials should be within the limit of the school budget; and finally, the materials should be able to convey understanding to the learners within the time allocated for

the lesson. If student-teachers are acquainted with this information, they would be able to select, design and produce appropriate TLMs for effective lessons.

4. Suggest Possible Solutions: Based on your investigations, which resources in your environment are suitable for the intended TLMs. Explore many local materials in order to attain appropriate one for your design. Derive ideas from shapes, pattern, textures or colours in your environment. Make free-hand drawings of possible shapes or form of your TLMs. Redesign the shapes or form until the most suitable is attained. Consider how design elements are organised in accordance with design principles to make your TLM attractive. Select appropriate tools and materials for the TLMs.
5. Prototype: Make a prototype TLMs in a suitable material that can function like the final one. If you are to produce only one TLM, this prototype may be the final work; but if you are to produce more of such TLMs, further designing may be necessary.
6. Working drawings: For mass production, working drawings are required. Draw the prototype of your TLM to technical scale. Create various pattern/part for final production.
7. Production (Making the article): This involves using the appropriate tools, materials, and techniques to produce the final TLMs. Here is where skills in technology or processes are applicable. The step by step making processes of all the TLMs produced are presented in chapter fours.
8. Appraisal (Evaluation): Trial-test the TLM to see if it is appropriate for the intended purpose. Assessment of TLMs could be done in a short classroom conference or

discussion. Teachers should gain confidence in their TLMs, and accept review comments from their colleague teachers. Utilize the TLMs in the actual teaching and learning session with an actual group of learners (Chand et-al, 2000). Critically evaluate your material against its purpose, suitability, craftsmanship, aesthetics and cost of production. If there are defects, make modifications (Amenuke, 1995).

The step by step procedures taken to produce all the TLMs, namely counting tray, counting materials, the manipulative solar system, the twelve point colour wheel and pattern making cards would be presented in chapter four.

3.5.2 Post-Intervention Procedures

The post-intervention seeks to evaluate the outcome of the action taken (Institute of Education-University of Cape Coast, 2013). The post-intervention procedures involve two main stages: the stage one evaluates the TLMs produced by student-teachers at the end of the training, while the stage two compares TLMs produced by the trainees with those ones used by student-teachers on the practicum.

- ***Stage One: Testing of TLMs in Lessons***

In order to evaluate the TLMs produced after the training programe, the student-teachers utilized their TLMs in lessons; to find out if the materials were appropriate, suitable, durable, attractive and interactive. Prior to the testing, student-teachers were taught how to use TLMs effectively in lessons. The following ten points were considered in that session:

1. Use TLMs that relate directly to the lesson objectives.
2. Incorporate the TLMs into the lesson preparation / notes.

3. Familialised yourself with the TLMs by rehearsing the lesson.
4. Make the TLMs available before the start of the lesson.
5. Explain to the learners how they would interact with the TLMs in the lesson.
6. Introduce the materials at the right time in the lesson.
7. Display the TLMs appropriately: maintain good posture, for example do not block learners' views.
8. Remove or conceal the TLMs right after use so that learners can keep focus.
9. Evaluate or revise TLMs after use.
10. Maintain safety of the TLMs: properly clean/wash/oil materials after use and keep them in case, container or cupboard.

The testing was done in two schools, namely Dormaa-Akwamu Methodist Primary and Berekum M/A Primary Schools. The selection of these two schools was based on proximity. The student-teachers utilised the TLMs fully in lessons, and their colleagues together with the researcher observed the lesson closely. After the lessons, discussions were held to evaluate the appropriateness, the suitability, durability, attractiveness and interactivity of the materials.

- ***Stage Two: Comparing TLMs Produced by the Trainees with those used by Student-teachers on the Practicum***

In this phase, TLMs produced by the student-teachers were compared with those used by student-teachers on internship programme. This is to measure the level of improvement, and skills that student-teachers have acquired after the training.

3.6 Data Analysis Plan

Qualitative data analysis is the breaking down of data into bits, and putting the bits together to make useful meanings (Ian Dey, 2005). Analysing qualitative data involves transcription, organizing data, familiarization, coding and generating themes (Lacey and Luff, 2007). The method, adapted for analysing this qualitative data was grounded theory. The founders of this theory, Glaser and Strauss (1967) defined it as the discovery of theory from data methodically acquired from social research. Grounded theory is an inductive and comparative methodology that provides systematic guidelines for gathering, synthesizing, analyzing, and conceptualizing qualitative data for the purpose of theory construction (Charmaz, 2001). Basically, the qualitative data generated from this study was analysed by extracting themes. Each research question is addressed separately as follows:

3.6.1 Research Question One: How proficient are student-teachers in TLMs design, production and utilization?

The findings yielded by the observations regarding student-teachers knowledge and skills on TLMs design, production and utilization; and interviews responses on difficulties/challenges that student-teachers encounter in making their own TLMs were presented in form of tables, text and pictures. The data was then analysed by description, categorization and extraction of themes as described earlier in sub-heading, 3.6.

3.6.2 Research Question Two: What measures can be employed to equip student-teachers with requisite knowledge and skills for selection, design and production of appropriate TLMs?

The concepts and themes extracted from the observations and interviews were integrated into the training of student-teachers on TLMs design and production. The chronology of event throughout the training process was recorded in the form of text and pictures. Thus, step-by-step procedures followed to produce the TLMs were described using words and pictures. The finished TLMs were presented in picture form.

3.6.3 Research Question Three: How effective are the TLMs produced by the student-teachers after testing?

Student-teachers were guided to utilize their newly designed TLMs in lessons for evaluation. In pre-lesson activities, the researcher and student-teachers critically critiqued the TLMs to find faults and rectify them. The teaching and learning activities were recorded in the form of pictures. At the end of every lesson, the researcher, together with the student-teachers evaluated the effectiveness, suitability, appropriateness, durability and flexibility of the TLMs. Themes were extracted and conclusions made.

3.6.4 Research Question Four: What is the level of improvement on the TLMs produced by the student-tecahers as compared to the previous ones used by the student-teachers on internship programme?

The printed images of new teaching and learning materials produced by the student-teachers; and that of the old teaching and learning materials used by the student-teachers were placed side-by-side. The level of improvements seen on the new **(N)** TLMs was captured in the form of positive statements and faults found on the old **(O)** TLMs were stated in the form of negative statements. TLMs were categorized into appropriate **(AP**) or inappropriate **(IP)** upon evaluations**.** Themes were generated from these statements and conclusions were made.

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF FINDINGS

4.0 Overview

This chapter presents the findings furnished by the study. Each research question is addressed separately. The results of the pre-intervention activities: personal observations and interviews are presented in the form of text and images and analysed by generating themes and deducing conclusions. The chronology of the intervention activities are also presented in the form of text and images and analysed through description, categorization and extraction of themes.

4.1 Research Question One: How proficient are students-teachers in TLMs design, production and utilization?

4.1.1 Findings from the Observations

Participant observation done by the researcher revealed that all the (30) student teachers knew the essence and the need to used TLMs in lessons; but they all lacked the knowledge and skills in TLMs design, production and utilization. As a result, sixty three percent (63%) of them used inappropriate TLMs in their lessons, thirteen percent (13%) used appropriate but monotonous TLMs, whiles the remaining thirty seven percent (37%) used chalkboard illustration as shown in table 6.

Table 6: The Use of TLMs by Student-Teachers

TLMs used by Student-Teachers	Number of Respondents	Percentage
Use of chalkboard illustration	11	37
Inappropriate TLMs	15	50
Appropriate but monotony of materials	4	13
Total	**30**	**100**

From table 6, thirty Seven Percent (37%) of respondents resorted to chalkboard illustrations, which may not give a clear picture of what is being taught. Since student-teachers lack skills in designing and producing concrete TLMs, they usually misuse chalkboard illustrations.

Plate 10: *Student-teachers using chalkboard illustration*

According to Karaka (2009) concrete materials enhance understanding of basic concepts no matter how the teacher plans. This is because the one who must learn is the child, not the teacher. The use of only the chalkboard illustration may not result to effective teaching and learning. Again, it was observed that all the TLMs used by the student-teachers were inappropriate. From table 6, fifty percent (50%) of student-teachers utilised inappropriate TLMs. The materials used in lessons are most effective when they are at the appropriate level and relate closely to the topics of instruction. Low-cost materials should be prioritized in order to ensure that all students have access to relevant materials (Hewlett Foundation, 2014; McEwan, 2013).

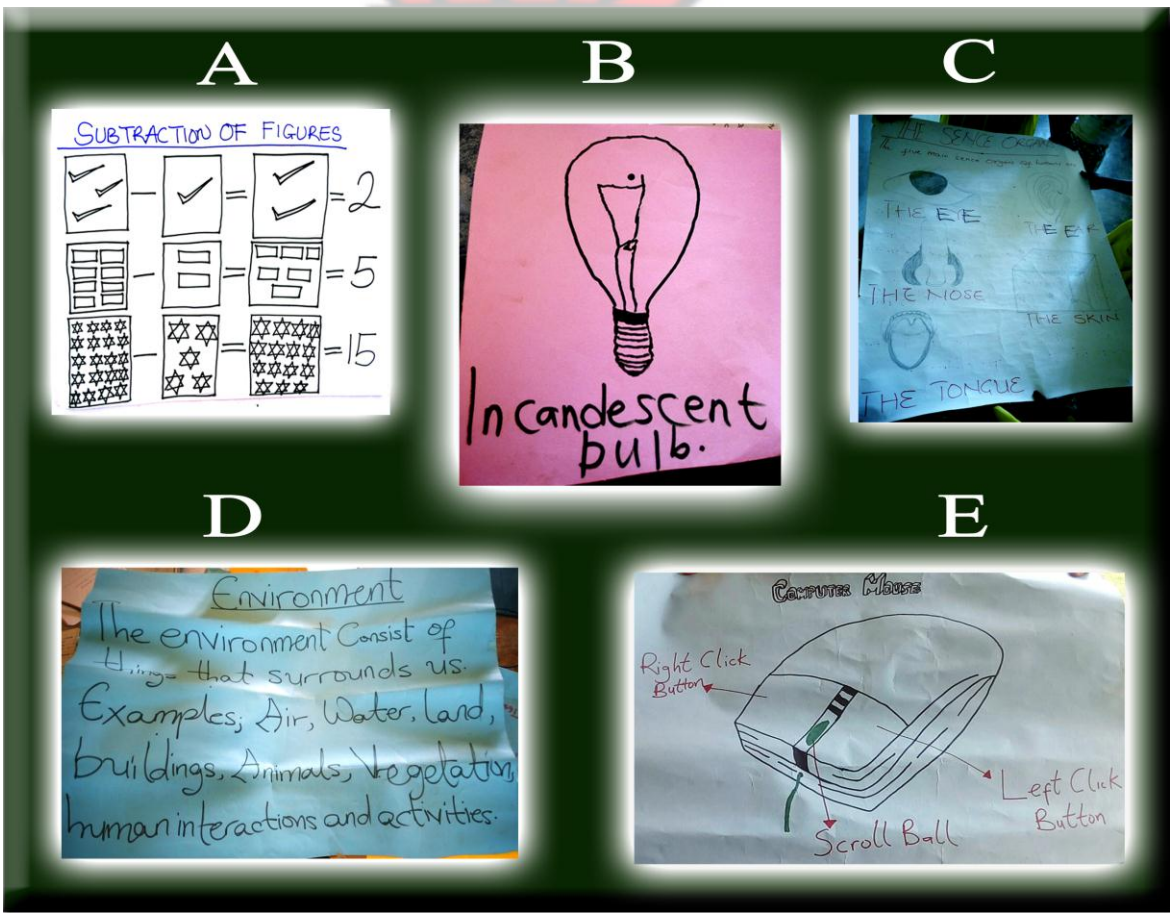

Plate 11: *Some inappropriate TLMs used by student-teachers*

From plate 11, all the three materials are inappropriate and unattractive, and cannot attract and sustain learner's interest. Material (A) is inappropriate because in teaching basic addition and subtractions, concrete materials such as counters made of bottle tops are required to enable pupils add and subtract numbers practically. In addition, material (B) is inappropriate because the student-teacher could have used real incandescent bulb for learners to observe, touch, feel and facilitate their understanding. Again, material (C) displayed lack of drawing and writing skills, rendering the sense organs different things, which do not show the clear picture of what, is being taught. The student-teacher could have used sense organs on pupil's body as her TLMs. Furthermore, material (D) is considered inappropriate because in teaching the 'environment' as a topic, object found in the environment could be used as TLMs. The object listed on the cardboard could have been written on the chalkboard. Finally, material (E) is inappropriate because there was a mouse in the school, which could have been used by the student-teacher to enable the pupils physical identify and click mouse button. Base on these five reasons, the researcher deduces that student-teachers lack knowledge and skills on TLMs design, production and utilization.

Also, the personal observation, as indicated in table 6, revealed that, only four (4) student-teachers representing thirteen percent (13%) of the respondents who used concrete and appropriate materials do not vary their materials in lessons.

Plate 12: *Appropriate but monotony of materials used by student-teachers*

The use of only one material for instructions results in boredom and monotony of lessons. Oppong et-al, (2009) assert that, for a teacher to enhance the quality and effectiveness of teaching and learning, he is bound to use a variety of instructional materials. The selection, utilization and evaluation of learning materials are very crucial, as "they are not ends in themselves but means to an end". There are countless materials available that student-teachers could have acquired freely from the environment and used as counters. To make the TLMs attractive, object such as pebbles, wood and canes can be painted and used as counters. Surprisingly, the only thirteen percent (13%) of the student-teachers who used appropriate TLMs, resorted to monotony of materials. The main materials employed student-teachers to teach addition/subtraction were dry seeds and beer bottle tops; which were not new to attract pupils' interest. However, the materials were appropriate but the student-teachers did not use variety of seeds and bottles tops to make them new and attractive to the pupils. All the Fifty percent (50%) inappropriate TLMs used

by the student-teachers observed were also not interactive. Their TLMs were mostly flat or two-dimensional objects, which pupils cannot manipulate and interact with them. Oppong et-al (2009) asserts that pupils should be given the opportunity to manipulate teaching and learning materials for a better understanding of the topic. It is believed that, students are able to retain only 10% of what they hear, 40% of what they see but 90% of what they do. It is therefore imperative on the part of the teachers to use as many relevant instructional materials as possible to facilitate the retention.

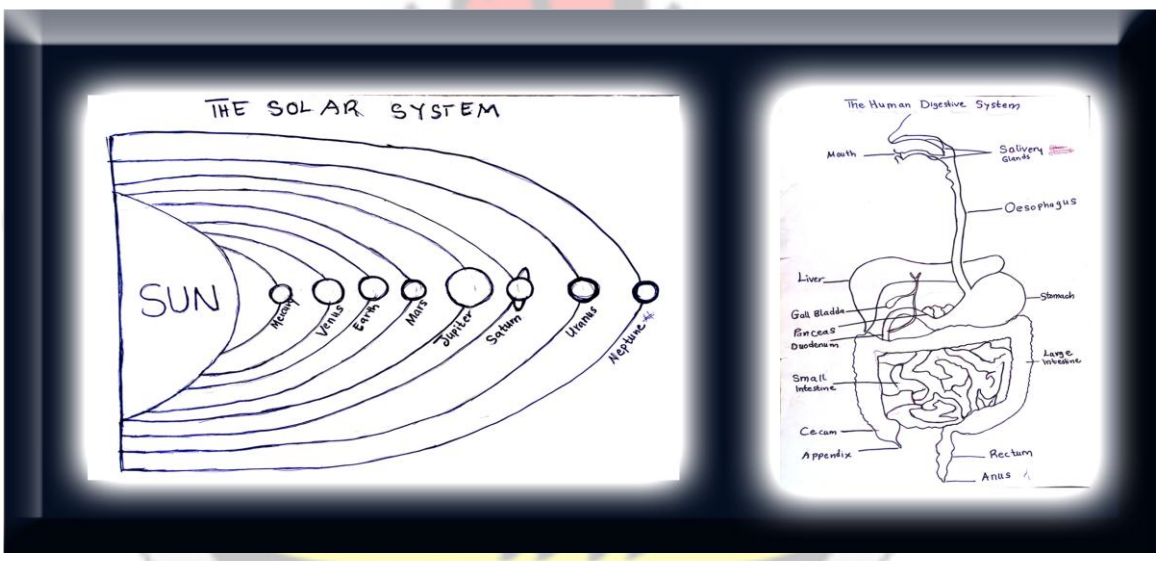

Plate 13: *Most common non-interactive TLMs used by the student-teachers*

From plate 13, learner's participation in lessons may be impaired as they cannot manipulate and interact with the materials effectively to enhance their understanding. The researcher believes that if manipulative TLMs were used in teaching the solar system and human digestive system in plate 13, pupils' participation in the class would be massive.

Table 7: Levels of Student-Teachers' Skills on TLMs Design, Production and Utilization

Levels of Skills	Number of Student-Teachers	Percentage
High	11	37
Average	15	50
Low	4	13
Total	**30**	**100**

Table 7 confirms that all the thirty student-teachers observed lack the requisite knowledge and skills in TLMs selection, design, production and utilization. This is because none of the student-tecahers observed demonstrated high level of skills on TLMs design, production and utilization. The thirteen percent (13%) of student-teachers who were rated average; used appropriate but monotony of materials as shown in plate 12. Although, the counters used for teaching mathematics were appropriate but the student-teachers did not use variety of counters to make learning more interesting and captivating. The remaining eighty-seven percent (87%) demonstrated low level of skills in TLMs selection, design, production and utilization. This eighty-seven percent (87%) comprises of the thirty seven percent (37%) of student-teachers who misused chalkboard illustration and the fifty percent (50%) of student-teachers who used inappropriate materials.

4.1.2 Findings of the Interviews

All the thirty student-teachers (representing 100%), who were interacted with, knew the essence of TLMs in teaching and learning, and hence the need to use them in lessons. Table 8 describes how student-teachers acquire their TLMs for their lessons.

Table 8: Do Student-Teachers Design Their Own TLMs?

Responses	Number of Respondents	Percentages
I make my own TLMs	8	27
Friends help me to make TLMs	7	23
I use chalkboard illustration	10	33
I use TLMs procured by the school	5	17
Total	**30**	**100**

From table 8, only twenty seven percent (27%) of respondents make their own TLMs. Twenty three percent (23%) of the respondents revealed that, their friends sometimes assist them to make their TLMs. The fifty percent (50%) of respondents, thus (27% + 23%) who strived to make their own TLMs, eventually produced inappropriate materials. The thirty-three (33%) percent who resorted to chalkboard illustration used it wrongly. Seventeen percent (17%) of student-tecahers utilized TLMs purchased by their schools, which were not manipulative and interactive to aid learner's participation during lessons as shown in plate 14.

Plate 14: *Some TLMs procured by schools and used by student-teachers*

From plate 14, though the TLMs procured by the schools are colourful and attractive, yet pupils cannot manipulate them to promote interaction and participation. Using the 'circuits and switches' in the bottom left of plate 14 as an example, the student-teacher could have acquired dry cells, copper wire, and bulb easily to enable pupils to practically carry out the activity. Again, if student-teachers are able design and produce their own TLMs, it would help to personalize teaching and learning. Teacher made-materials add personal touch to teaching that students appreciate (Block, 1991). In

conclusion, the table 8 and plate 14 confirm that, all the student-teachers interrogated lacked requisite knowledge and skills for TLMs selection, design, production and utilization.

Table 9: Challenges / Difficulties Student-Teachers Face in Designing TLMs

Challenges	Number of Respondents	Percentage
Finance	12	40
Lack of Skills	15	50
Time Constraint	3	10
Total	**30**	**100**

From table 9, the major challenges/difficulties that student-teachers face in making their own TLMs include: lack of finance, lack of skills on TLMs design and production and time constraints. The student-tecahers lamentations on these challenges are described as follows:

- **Finance:** Forty percent (40%) of the student-teachers interviewed lamented on lack of money to buy tools and materials for design and production of TLMs.
- **Lack of skills in TLM design and production (drawing and lettering skills):** Fifty percent (50%) of student-teachers interviewed bemoaned of the difficulties that they face in drawing and lettering, in making their own materials.
- **Time Consuming:** Only ten percent (10%) of the respondents were of the view that, making their own TLMs is time consuming, as they have to prepare lesson

notes and mark class exercises. The researcher can deduce that, because student-teachers lack basic skills in TLM design and production, they spend a lot of time in producing their own materials.

Table 10: Specific Skills that Student-Teachers Lack in Making TLMs

Lack of Skills	Number of Respondents	Percentages
Drawing Skills	24	80
Lettering Skills	6	20
Total	**30**	**100**

From table 10, eighty percent (80%) of student-teachers interviewed bemoaned of the difficulties they encounter when drawing objects or illustrations for their TLMs. The remaining twenty percent (20%) complained that they found it difficult to write words boldly on the cardboard for pupils to see and read clearly from afar. The researcher believes that, student-teachers have limited the skills in TLMs design and production to only drawing and lettering because their TLMs were mainly made of cardboard. Thus, they usually draw and write something on the cardboard and used as TLMs. The researcher believes that, because student-tecahers lack basic drawing and writing skills, they spend a lot of time in making their own TLMs. Based on this, it can be deduced that if student-teachers are equipped with requisite knowledge and skills on TLMs design and production, it would help to reduce time that student-teachers spend on making their own materials.

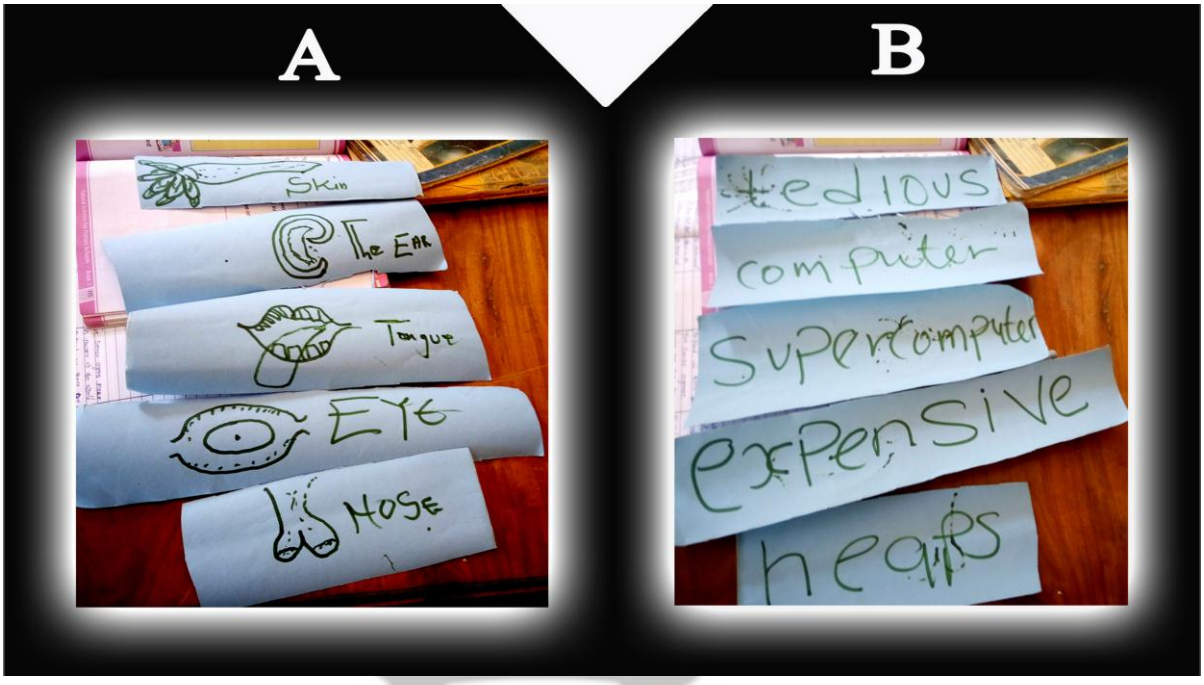

Plate 15: *TLMs showing lack of drawing and lettering skills*

From plate 15, the material (A) demonstrates lack of drawing skills on the part of student- teachers. The organs were poorly drawn, and they misrepresented what the student-teacher intended to portray. Consequently, pupils may not be able to identify the organs, and this will affect their understanding. Again, material (B) reveals the lack of lettering skills of student-teachers. Both materials are inappropriate and unattractive.

All the thirty (30) student-teachers interviewed asserted that, in many cases, their TLMs were not appropriate and effective for the lessons, but they have no option than to use them; since Institute of Education-UCC assessment criterion requires that student-teachers must use TLMs in every lesson as shown in Appendix C.

Table 11: Common Faults Found on Student-Teachers' TLMs

Fault (Inappropriateness)	Number of Respondents	Percentages
Poor drawing / illegible text	9	30
Difficulty in hanging/pasting TLMs	8	27
Materials are not durable / flexible	7	23
Unattractive materials	6	20
Total	**30**	**100**

From table 11, all the thirty (30) student-teachers interviewed identified faults on their materials: rendering their TLMs inappropriate and ineffective for the intended lessons. The following were some of the common faults enumerated.

i. **The TLMs have poor drawing and lettering:** Thirty percent (30%) of the respondents agreed that sometimes their TLMs are not effective for the intended lesson because of poor drawing and labeling. This is because of the lost of details in illustrations and illegible text.

ii. **Difficulty in pasting or hanging the materials:** Twenty seven percent (27%) of TLMs produced by the student-teachers on practicum do not have handles, and hence cannot be hanged or pasted. They usually hold the materials while teaching or they call pupil (s) to hold it in front of the class. In some cases, masking tape is used to fix the material on the chalkboard; and occasionally, the materials fall whiles teaching is ongoing.

iii. **The materials are not durable and flexible:** Twenty three percent (23%) of the respondents lamented on durability and flexibility of the material used for making the TLMs. Cardboards, which are mainly used for their TLMs, are easily torn upon manipulations.

iv. **Unattractive materials:** Twenty percent (20%) of the respondents indicated that their TLMs were not new to the learners, and therefore they are not attractive enough to attract and sustain pupils' interests**.** This is because the pupils are used to the materials**.** The most common materials for the student-teachers are posters made of cardboards, and counters made of seed and bottle tops for teaching addition and subtraction.

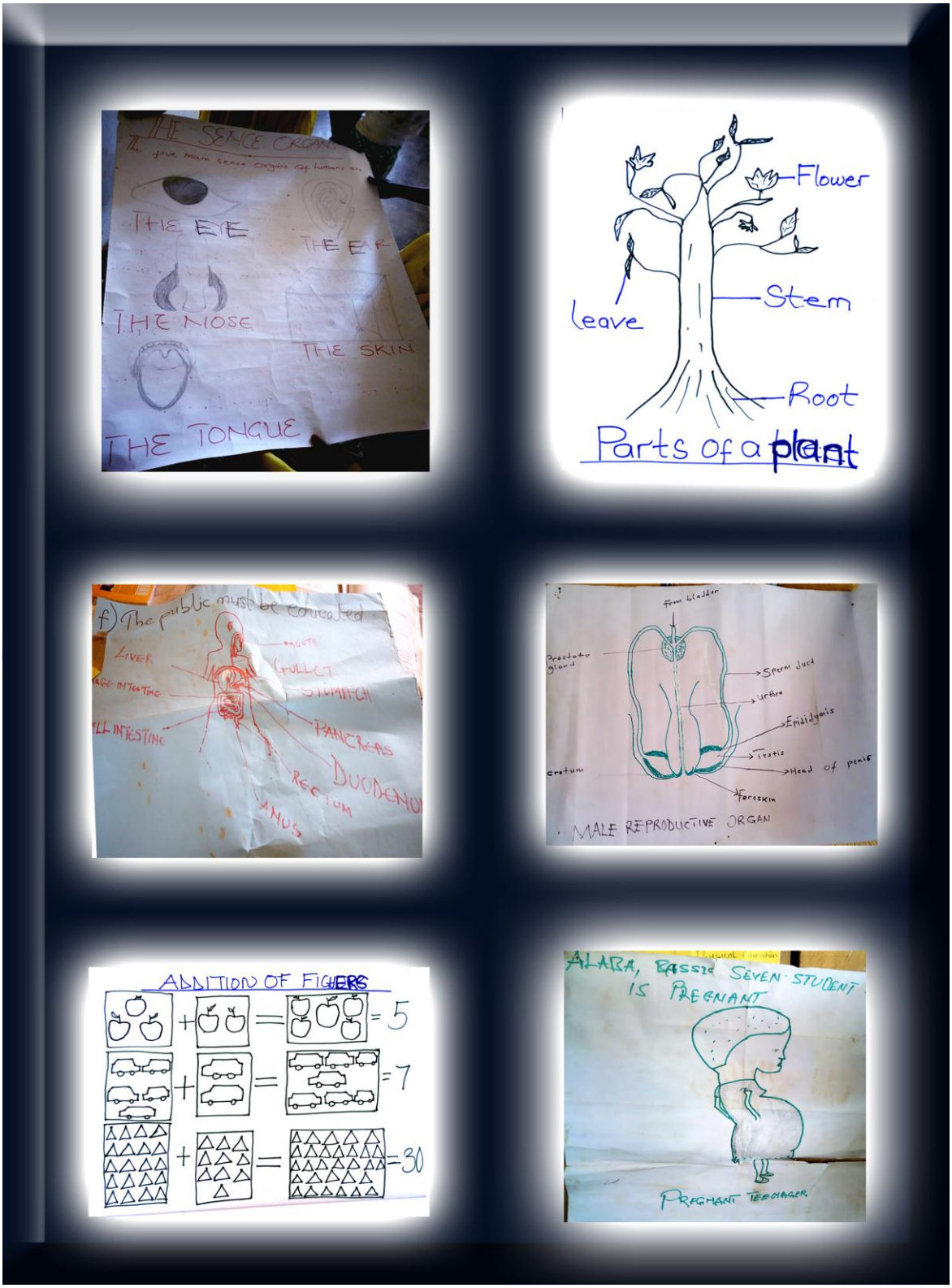

Plate 16: *Student-teachers' TLMs showing common faults*

From plate 16, all the TLMs demonstrate the four main characteristics of faulted TLMs as enumerated by student-teachers. All the four TLMs are difficult to hang or paste; they are not durable and flexible; they show lack of drawing and lettering skills; and finally, they are not attractive. As a result, they are not appropriate TLMs, and when used in lessons the intended lesson objective may not be achieved.

4.2 Research Question Two: What measures can be employed to equip student-teachers with requisite knowledge and skills for selection, design and production of appropriate TLMs?

The intervention procedures involve two main stages: In the first stage, student-teachers were taken through basic drawing and lettering skills which manifested as fundamental skills that student-teachers lack. In the second stage, student-teachers were trained on TLMs design and production.

4.2.1 Intervention Results

- ***Stage One: Drawing and Lettering Lessons***

As part of the activities to equip student-teachers with requisite knowledge and skills in TLMs design and production, trainees were successfully taken through basic drawing and lettering skills as indicated in chapter three. The impact of this training was impressive and enormous as expressed in the trainees' works.

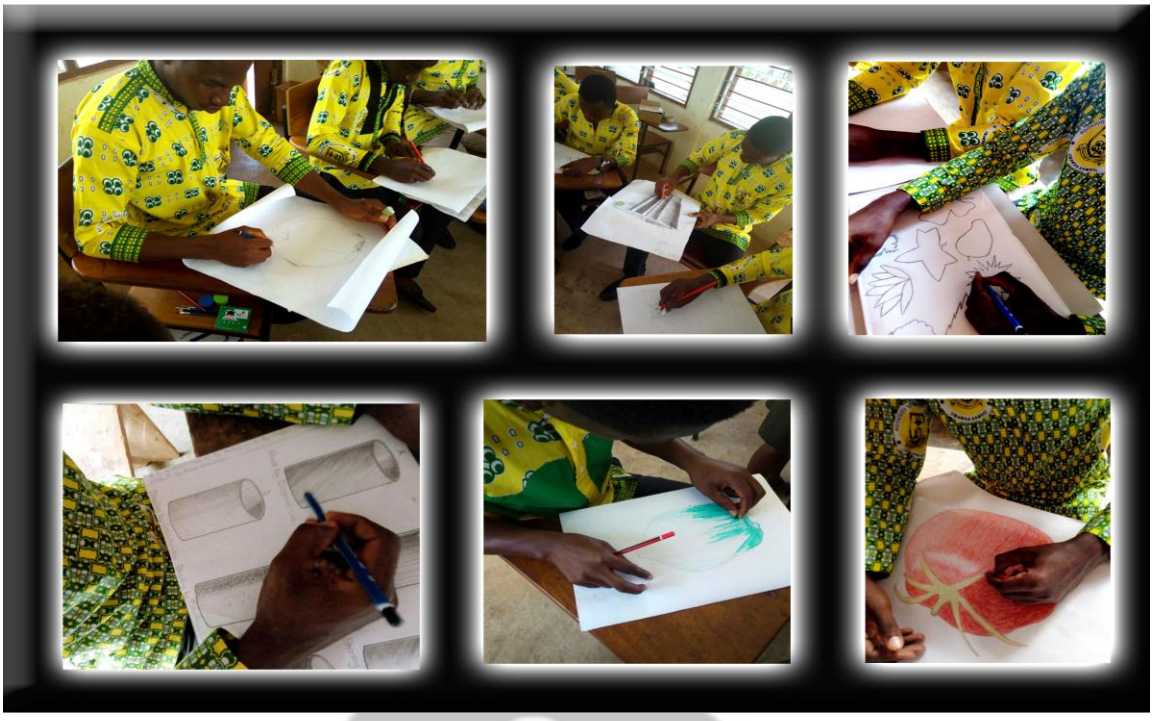

Plate 17: *Student-teachers under basic drawing training*

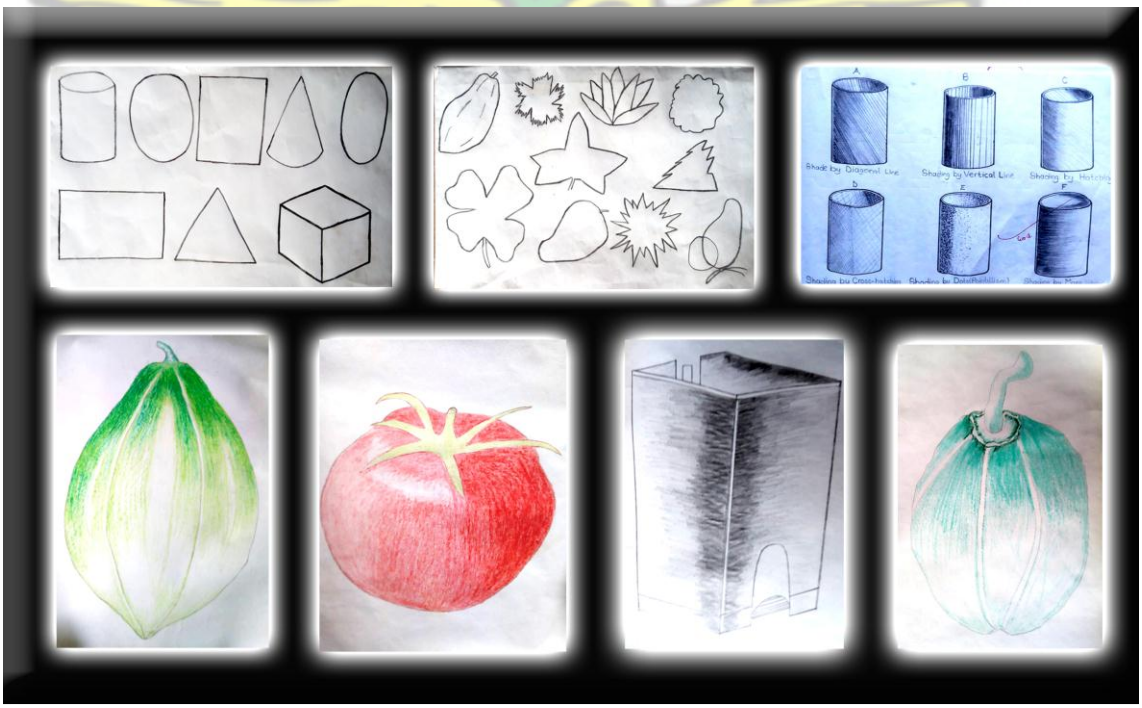

Plate 18: *Samples of student-teachers drawings*

From plate 18, the length of skills attained in drawing and lettering by the trainees was very high as compared to the previous TLMs used by their colleagues on practicum. At the end of this session, participants were able to draw and shade basic shapes effectively. Researcher believes that, once student-teachers have been equipped with drawing and writing skills, they would be able to produce appropriate TLMs involving drawing of basic shapes. In order to resolve lettering difficulties on the part of the student-teachers, they were again taken through lettering (freehand lettering) skills.

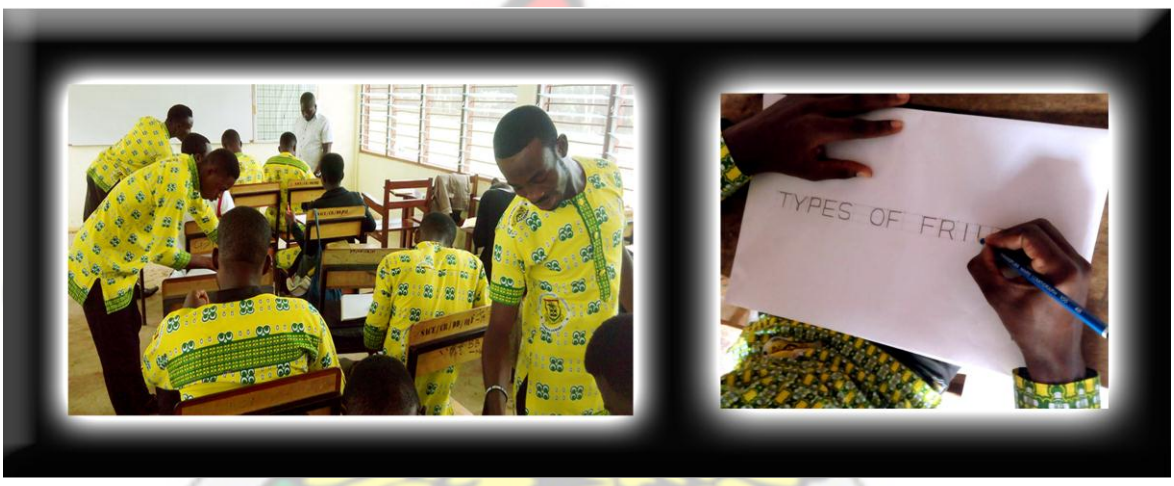

Plate 19: *Student-teachers in lettering session*

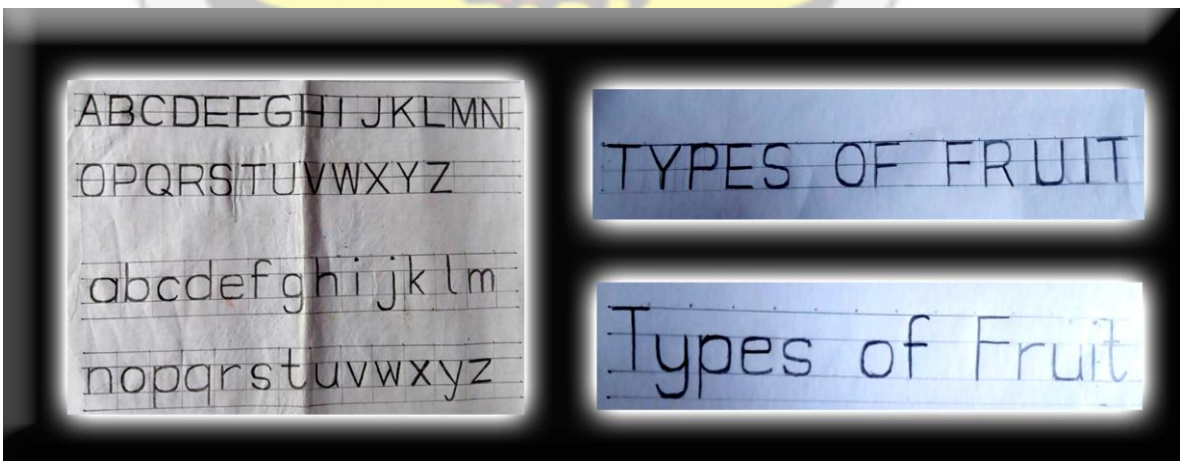

Plate 20: *Samples of trainees' works during lettering session*

From plate 20, student-teachers' works have shown tremendous improvement as compared with the writings in plates 15 and plate 16. The researcher believes that lettering/writings on the student-teachers' TLMs would improve, since they have demonstrated the acquisition of good lettering skills.

- ***Stage Two: Training Student-teachers on TLMs Design and Production***

This session was where student-teachers were equipped with requisite skills needed for TLMs design and production. Although the general procedures for making the TLMs were presented in chapter three, here, systematic procedures that were followed to produce each teaching and learning material are presented with the aid of illustrations and pictures. The following were the TLMs produced during the training:

1. The Manipulative Solar System
2. The Counting Tray
3. The Counting Materials
4. The 3D Human Digestive System
5. The 12-Point Colour Wheel
6. Pattern Making Cards

4.2.2 Making Teaching and Learning Materials (TLMs)

4.2.2.1 The Manipulative Solar System

Problem: To design and produce the manipulative solar system for teaching the topic, 'The Solar System' in the integrated science syllabus in primary school.

Tools Used: cutter, a pair of scissors, sand paper, pencil, pen, ruler, and painting brush.

Materials Used: strawboard, bond paper, liner, rope made of leather, styrofoam, glue, and acrylic paint.

Brief Description of the Work

The manipulative solar system is made up of the base measuring 76 cm long and 33 cm wide, which is made of strawboard and covered with lining material. The orbits or paths of the planets were created using leather ropes. The sun and the nine planets were carved from styrofoam, and they were then painted using acrylic paints. The labeling of the sun and the planets were achieved by writing their names on the masking tape and fixing them accordingly.

The Making Process (Step-by-step procedures)

Step 1: Preliminary Design - The information gathered from the investigations and research was put into series of sketches in order to determine the layout of the intended TLM. The best layout was selected and drawn to scale on bond paper. Note that, after attaining the layout, several materials available on the environment were explored before appropriate ones were adopted for the design. The size of the manipulative solar system is 76 cm long and 33 cm wide as shown in plate 20.

Step 2: The base was first prepared: by measuring the size 33 cm on the strawboard with the help of metal rule and pencil. The same size of strawboard was cut and glued together to strengthen the base as shown in plate 20.

Plate 21: *Measuring, cutting and gluing strawboard to form base of the TLM*

Step 3: Lining material was then used to cover the strawboard to conceal the strawboard and make it attractive. This was done by applying the glue on both surfaces of the strawboard and that of the lining materials. Immediately, the liner was used to cover the strawboard gently as shown in plate 22. The glue was not allowed to dry completely to prevent the lining material from crumpling.

Plate 22*: Covering the strawboard with lining material by gluing*

Step 4: Rope (made of leather) was used to create the orbits (path of the planets) as well as boarder line. This was done by measuring and cutting the rope and gluing them accordingly as shown in plate 23.

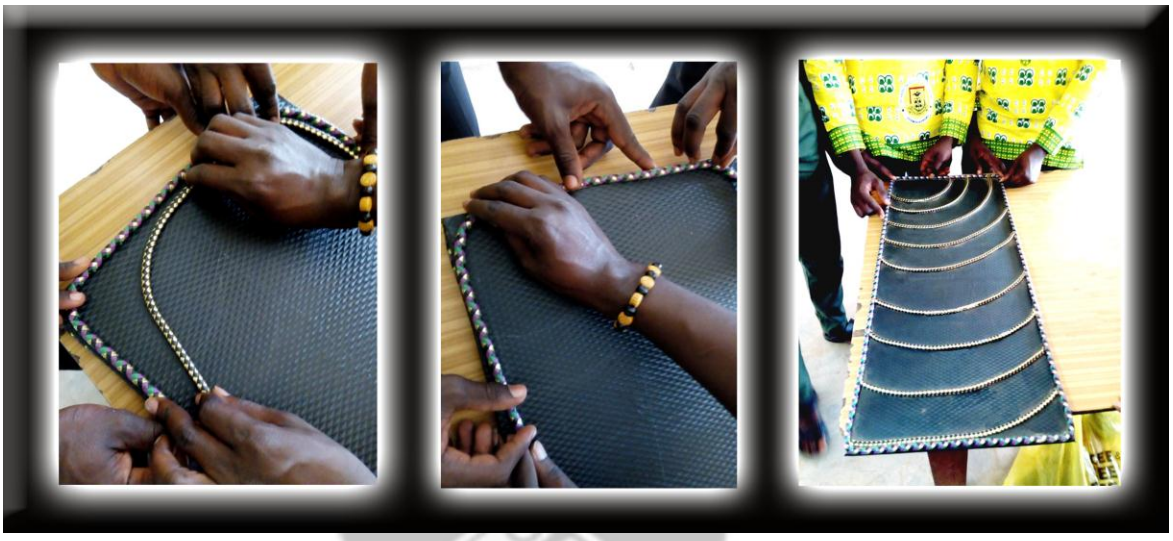

Plate 23: *Creating paths or orbits for the planets using leather rope*

Step 5: The sun and the planets were carved from styrofoam found in refrigerator that has been disposed of; by cutting and shaping the foam to the required size using cutter and sand paper as shown in plate 24.

Plate 24: *Cutting and shaping high density foam into planets*

Step 6: Small holes/pathway were created at the bottom of the planets so that they can easily be fixed temporarily on their paths and move freely as shown in plate 25. This is to facilitate manipulations.

Step 7: The sun and the planets were coloured using acrylic paint and brush as shown in plate 25.

Plate 25: *Painting of the sun and planets into individual colours*

Step 8: The planets were labeled from numbers 1 to 9, thus, 1 being mercury, 2 being venus, 3 being mars etc. The names of the planets were fixed on various paths or orbits. The final manipulative solar system is shown in plate 26.

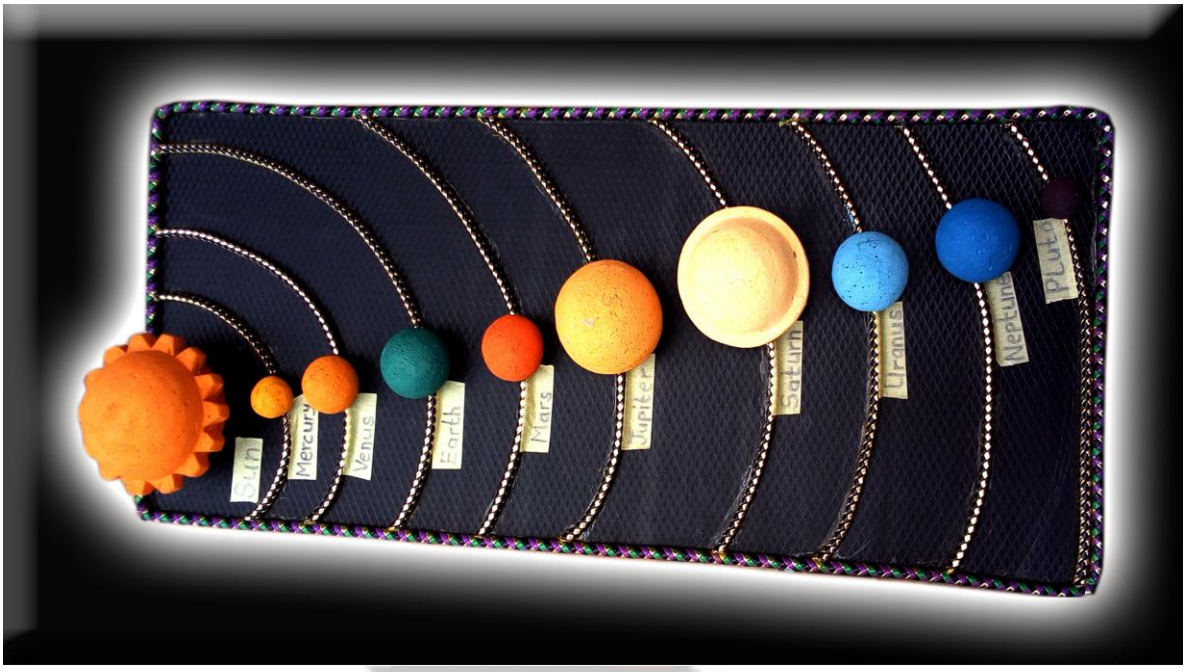

Plate 26: *The final manipulative Solar System*

Uses: The manipulative solar system in plate 26 can be used to teach the topic 'solar system' in the science syllabus at primary school.

4.2.2.2 The Counting Tray

The problem: To design and produce counting tray to provide support for counting materials (counters) in the lower primary.

***Tools Used*:** ruler, pencil, marker, a pair of scissors, cutter, saw blade and bristle brush.

Materials Used: strawboard, liner, adhesive, acrylic paint and paper roll.

Brief Description of the Work

The counting tray is made up of rectangular base and ten cylindrical with varying heights that can be arranged in ascending or descending order. The cylinders are numbered 1 up to 10; the cylinder 1, being the shortest in height and cylinder 10, being the tallest in height.

The Making Process ((Step-by-step procedures))

Step 1: Preliminary Design - based on the information gathered from the investigations and research, series of sketches was produce to attain the layout of the intended TLM. The best layout was selected and drawn to scale on bond paper.

Step 2: In preparing the base, strawboard was measured 75 cm by 45 cm using ruler and a pencil. It was then cut by using cutter, and a ruler as a guide. The same measurement was attained using the same technique and procedures. The two strawboards were glued together to make the base strong. Lining material was then used to cover the strawboard, to make it attractive and durable as shown in plate 27.

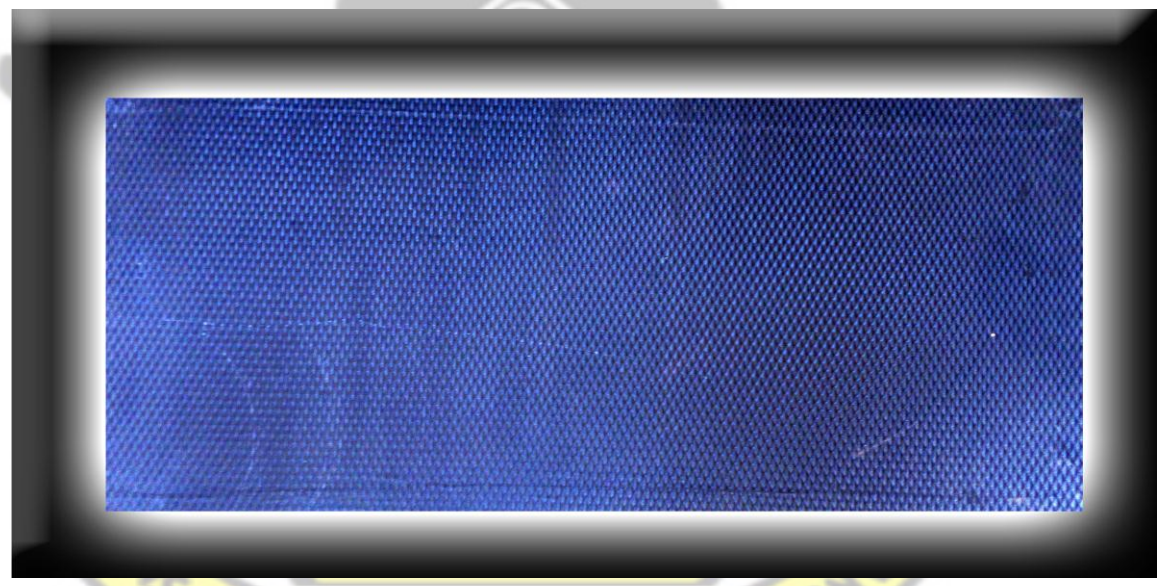

Plate 27: *Base of the Counting Tray*

Step 3: The paper roll, measuring 7 cm in diameter was cut into ten different heights. The heights of the cylinders were 7.5 cm, being the highest; followed by 7 cm, 6.5 cm, 6 cm, 5.5 cm, 5 cm, 4.5 cm, 4 cm, 3.5 cm and the lowest cylinder being 2 cm high.

Plate 28: *Preparing the ten cylinders*

Step 4: The cylinders were painted in attractive colours using acrylic paint and bristle brush. The cylinders were then numbered 1, 2, 3, 4, 5, 6, 7, 8, 9, 10; which would enable pupils to identify numbers and count them. The final counting tray is shown in plate 29.

Plate 29: *The final Counting Tray*

Uses: The Counting tray in plate 29 will serve as support for counters. It can also be used to teach colour identification and, ascending and descending order in mathematics.

4.2.2.3 The Counting Materials (counters)

Tools: cutter, ruler, pencil, chisel, hammer, nail, container (colour palette)

Materials: canes, pebbles, broken tiles, bottle tops, styrofoam, and acrylic paint.

Problem: To explore and produce varieties of materials that could be used as counters to teach basic counting, addition and subtraction in lower primary.

Brief Description of the Problem

Based on the researcher's personal observations, student-teachers used seeds, and bottle tops in their raw states as counters; which were not new and therefore unattractive to pupils. In order to make counters attractive and interesting, varying materials such as canes, pebbles, tiles, form, and bottle tops were explored, they were coloured and employed to teach basic counting, addition and subtraction in lower primary.

The Making Process (Step-by-step procedures)

i. ***Cane Counters:*** Cane was measured 10 cm long and cut into pieces with the help of cutter. The ends of the canes were rounded and painted using acrylic paint as shown in plate 30.

ii. **Pebble counters:** Pebbles were collected and painted with different colours using acrylic paint. Note that, the paintings of all the counters were achieved by mixing the desired clours with brush in the container and placing the counters in it and shaking the container for the counters to be well coloured. The counters were removed and allowed to dry as shown in plate 30.

Plate 30: *Counters made of pebble and canes*

iii. **Tile Counters:** Broken tiles were collected and they were further broken into small rectangular sizes using chisel and hammer.

iv. **Foam Counters:** High-density foam found in a disposed of, refrigerator was cut into small squares using cutter. They were then shaped into rounded forms using sand paper; and they were painted in different colours using acrylic paint.

v. **Bottle Top Counters:** Different bottle tops were collected, and holes were created in the bottle tops. In the plastic bottle tops, the holes were created using a heated nail; and with the aluminum bottle tops, the holes were created using hammer and unheated nail. A rope was used to connect the bottle top as shown in plate 31

Plate 31: *Counters made of broken tiles, styrofoam and bottle tops*

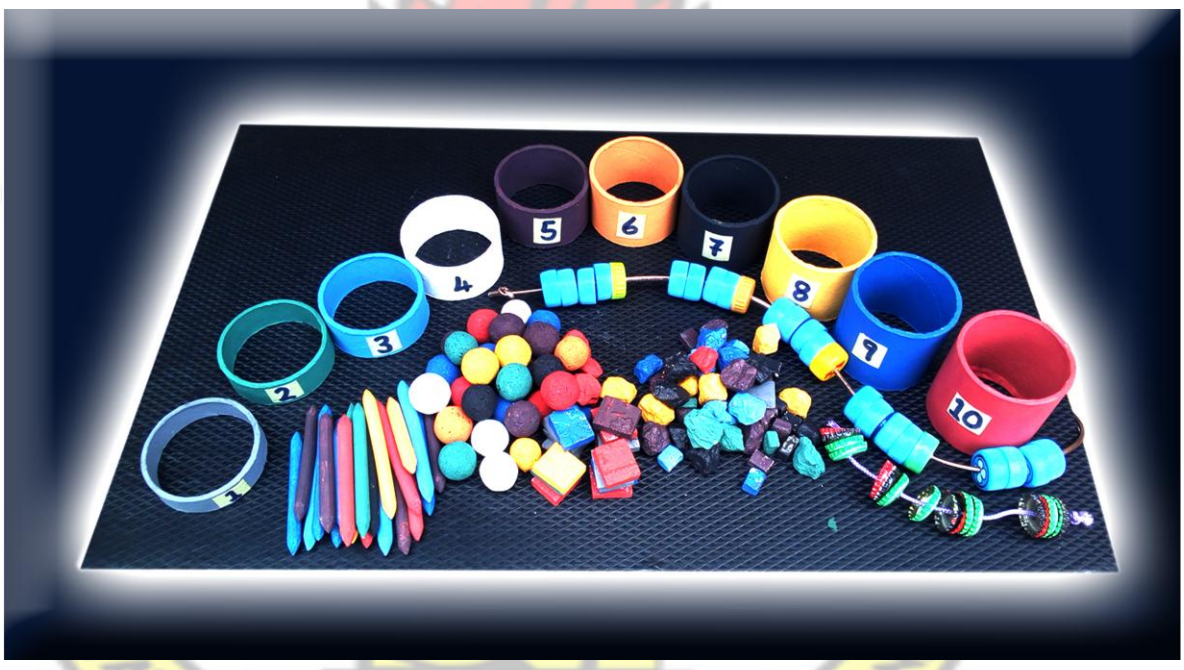

Plate 32: *The Counting Tray and Counters*

Uses: The final counting tray and varying counting materials in plate 32 can be used to teach basic counting, addition and subtraction at primary schools.

4.2.2.4 The 3D Human Digestive System

The Problem: To design and produce 3D model of Human Digestive System for teaching the topic, 'The Human Digestive System' in the Integrated science syllabus at primary basic schools.

Tools Used: Cutter, pencil, pen, ruler, brush, and sand paper

***Materials Used*:** strawboard, liner, synthetic leather, adhesive, acrylic paint, rope made of leather and high-density foam found.

Brief description of the problem

The intended TLM is a 3D model of Human Digestive System, which is made up of a dark background holding the features of human digestive system. The body is made of gold synthetic leather; the intestines were made of leather rope; and other features such as liver, stomach, gall bladder, pancreas and salivary glands were made of high-density form.

The Making Process (Step-by-step procedures)

Step 1: Preliminary Design - The information gathered from the investigations and research was put into series of sketches in order to determine the layout of the intended TLM. The best layout was selected and drawn to scale on bond paper as shown in plate 33.

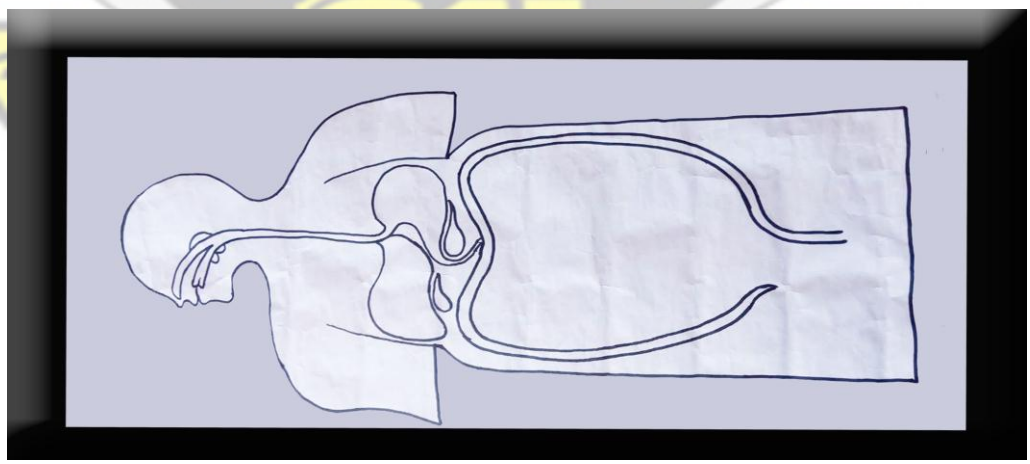

Plate 33: *The layout of the 3D Human Digestive System*

Step 2: The base measuring 30 inches by 17 inches was first prepared. The procedures followed to prepare the base is the same as that the base of the solar system and counting tray.

Step 3: The layout was first transferred unto the synthetic leather; by shading the back of the bond paper with a pencil, and with the shaded part facing the leather tightly, a pen was used to go through the design. It was then cut and glued unto the background as shown in plate 34.

Step 4: The intestines were created by measuring and cutting the rope to the required lengths and applying the glue onto the rope. Immediately, the rope was twisted and forced to form the oesophagus and intestines as shown in plate 34.

Plate 34: *Preparing the body and intestines of the 3D Human Digestive System*

Step 5: Parts such as liver, stomach, gall bladder, pancreas and salivary glands and mouth were created from high-density foam; by cutting and shaping them to the required

shapes and sizes using cutter and sand paper. They were then painted and glued to their positions as shown in the final work. Various parts were labeled using stickers.

Plate 35: *Preparing and fixing of liver, stomach, pancreas and other parts*

Step 6: The back of the TLM was fixed with a handle made of robber rope and fastened with office pins, which would make it easier for hanging during lessons. The final 3D human digestive system is shown in plate 36.

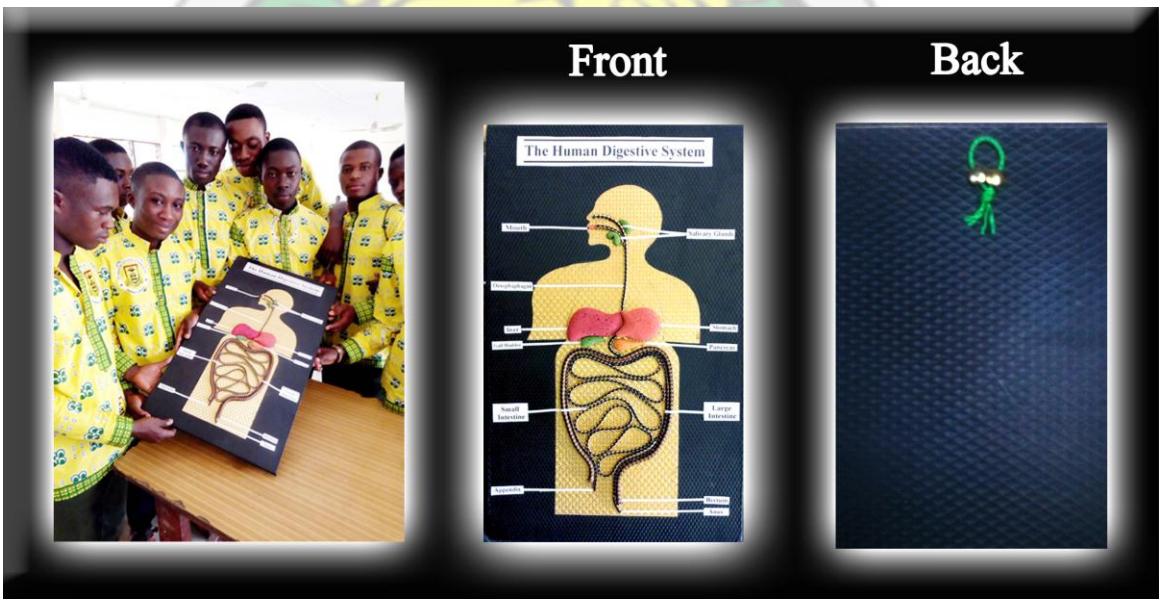

Plate 36: *Front and back views of the 3D Human Digestive System*

Uses: The 3D human digestive system can be used to teach the topic, 'The Human Digestive System', in the integrated science syllabus at primary schools. The labels attached to the names can be detached and reattached to enhance interactivity during lessons.

4.2.2.5 The Manipulative 12-Point Colour Wheel

Problem: To design and produce manipulative 12-point colour wheel, for teaching colour work at primary schools.

Tools Used: cutter, ruler, brush, pencil, pen and a pair of scissors

Materials Used: strawboard, cardboard, liner, glue, styrofoam and acrylic paint

Brief Description of the Problem

The intended 12-point colour wheel is in 3D form and can be manipulated by learners during lessons. It consists of a base on which the individual colours made of hard density foam are arranged to form the 12 point colour wheel.

The Making Process (Step-by-step procedures)

Step 1: Preliminary Design- Several designs of colour wheels were observe on the internet to gain insight and inspiration. Several sketches were made on cardboard, and the best layout was selected; and it was further developed and painted accordingly to determine how final work would look like.

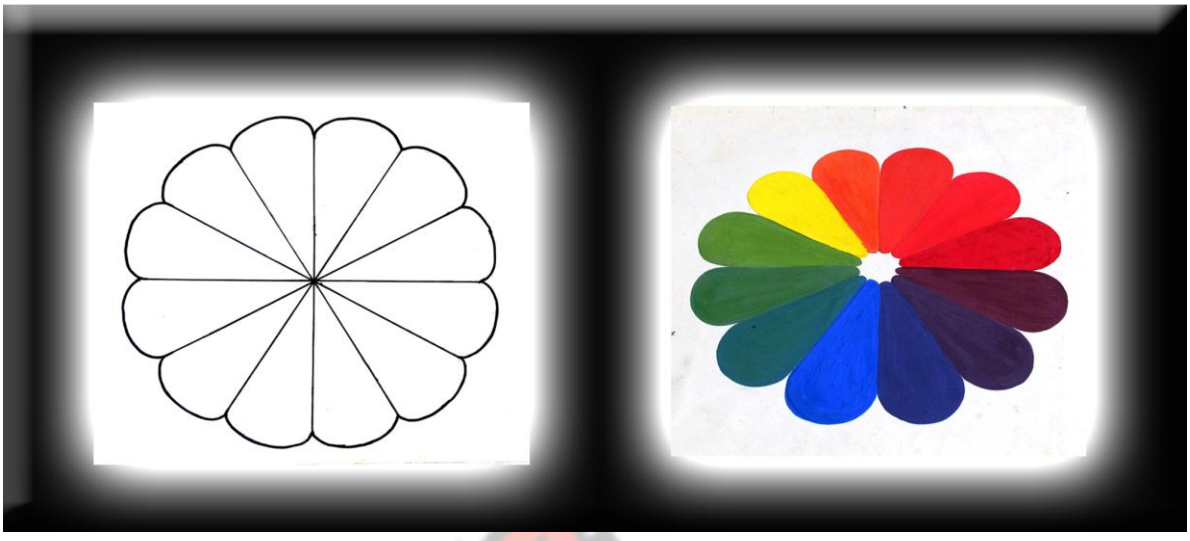

Plate 37: *Layout derived from the preliminary designs*

Step 2: The base measuring 18 inches by 24 inches was first prepared. The procedures followed to prepare the base is the same as that the base of the solar system and counting tray.

Step 3: The template was obtained from the design by cutting. The template was then placed on the styrofoam, and it was measured and cut. Twelve of them were obtained and they were sharpened to the required forms using sand paper.

Plate 38: *Cutting and preparing templates for individual colours*

Step 3: The templates were painted into individual colours using acrylic paint and low-density foam. The colours were mixed in their right proportions. The primary colours: red, yellow and blue were painted first. The secondary colours were painted by mixing equal proportion of two primaries followed by the intermediate colours, which is the mixture of a primary colour and its neighboring secondary colour. The colour mixing is illustrated in the plate 39.

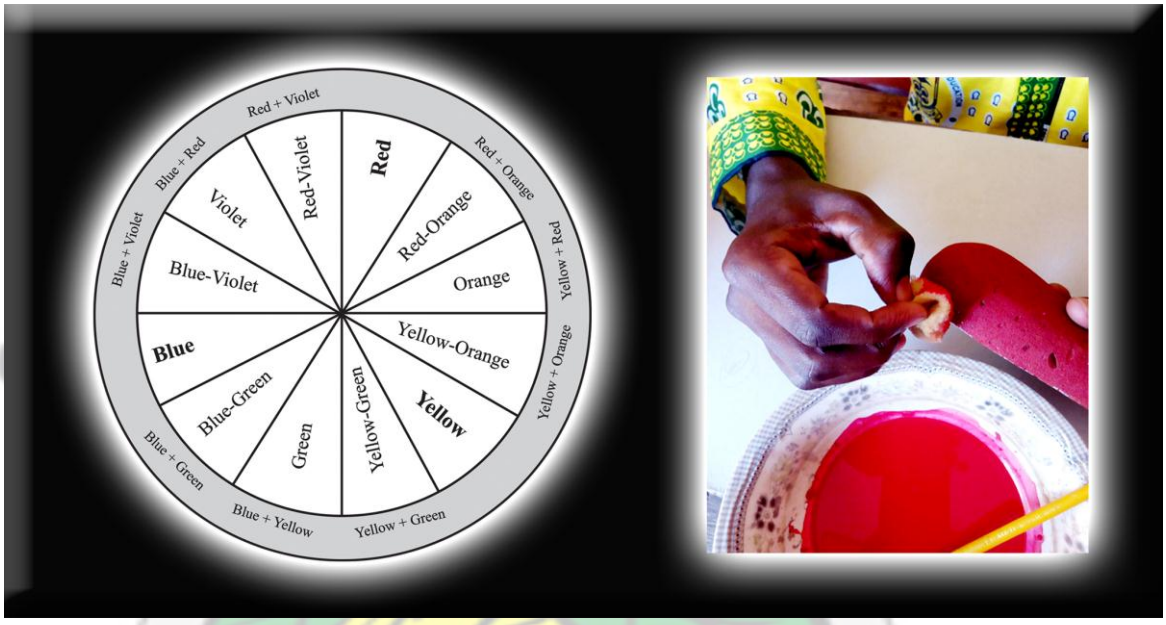

Plate 39: *Colour mixing and painting of the Manipulative 12-Point Colour Wheel*

In painting the 12-point colour wheel, primary colours where painted first, followed by the secondary colours and lastly, the intermediate colours as shown in plate 40.

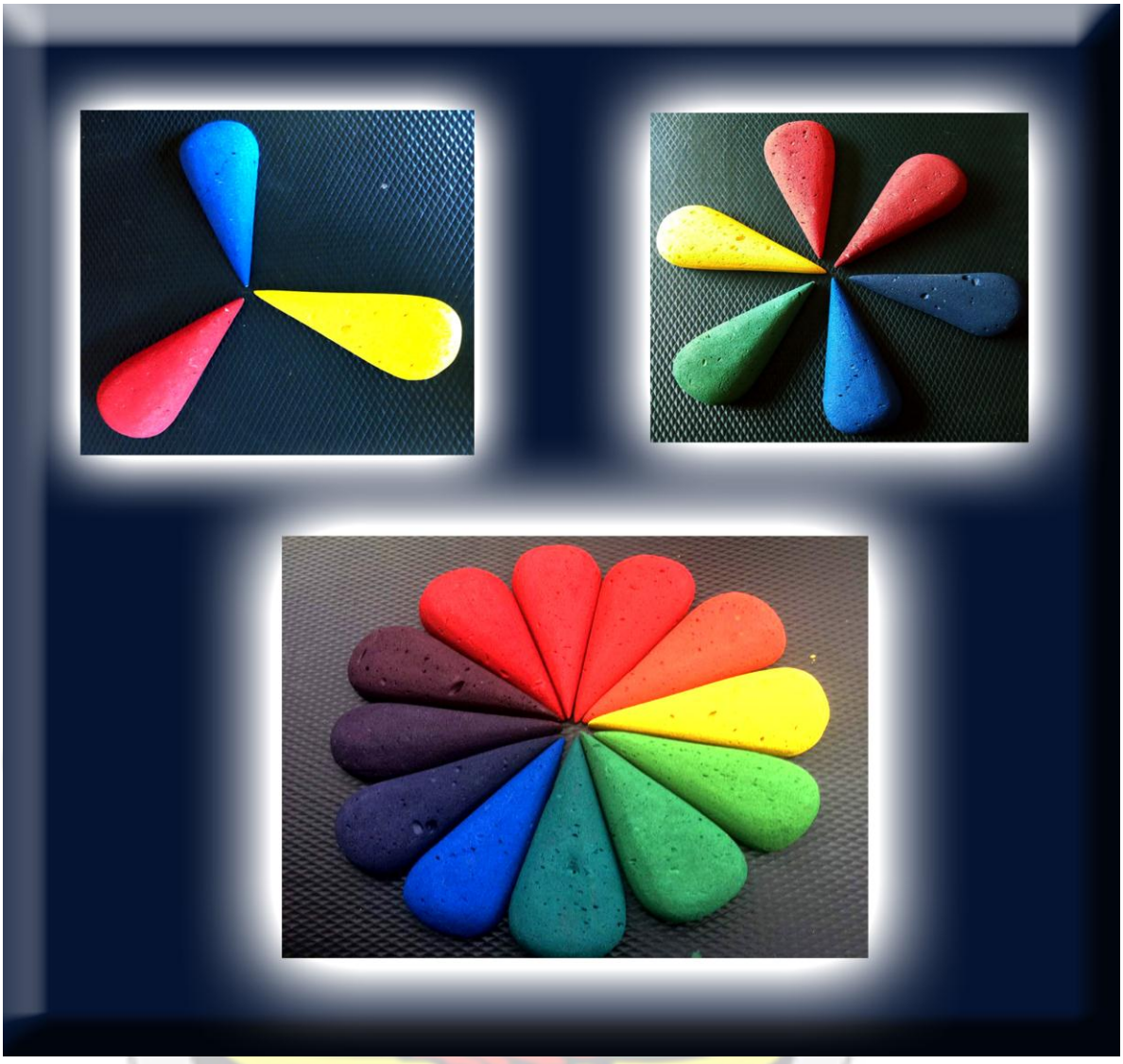

Plate 40: *The Manipulative 12-Point Colour Wheel*

Uses: The manipulative 12-point colour wheel in plate 40 can be used for teaching colour work in various schools regardless of learners' levels. Pupils can touch and manipulate the individual colours for effective teaching and learning, and ease their understanding.

4.2.2.6 Pattern Making Cards

Problem: To design and produce pattern making cards for teaching the topic, 'pattern making' in the creative arts syllabus in basic school.

Tools Used: cutter, ruler, pencil and brush

Materials Used: strawboard and acrylic paint

Brief Description of the problem

The intended pattern making cards are 'L' and 'V' shaped cards made of strawboard; and they were painted using acrylic paint and brush. They can be arranged on a surface to create pattern and designs.

The Making Process (Step-by-step procedures)

Step 1: Preliminary Design - variety of shapes were explored to determine which one could create interesting pattern when it is repeated severally. Consequently, 'L' and 'V' shape were adopted for the design.

Step 2: The adopted shapes: 'L' and 'V' were drawn on the strawboard and cut using cutter and ruler as a guide.

Step 3: They were then painted using acrylic paint and brush as show in plate 41.

Plate 41: *Measuring, cutting, and painting of Pattern Making Cards*

Plate 42: *Pattern Making Cards for creating pattern, textures and designs*

Uses: The final pattern making cards can be arranged on a surface to create interesting patterns as shown in plate 42.

4.3 Research Question Three: How effective are the TLMs produced by student-teachers after testing?

In order to evaluate the TLMs produced after the training, student-teachers utilized them in the real classroom lessons; to test for their appropriateness, suitability, durability and flexibility, attractiveness and interactivity. Testing was done in Dormaa-Akwamu Methodist Primary School and Berekum Municipal Assembly Primary School. Prior to every lesson, preparations were made and the TLMs were pre-tested in the form of lesson rehearsal so that if there were any fault, they could be detected and rectified. This was also to enable trainees to be familiarized with the use of the TLMs.

4.3.1 Testing of the Manipulative Solar System

The Manipulative Solar System was used by the student-teachers to teach the topic, 'the solar system' in class four of both schools: Berekum Municipal Assembly Primary and Dormaa-Akwamu Methodist Primary. Prior to the lessons, the student-teachers together with the researcher planned and rehearsed the lesson in order to familiarize themselves with the use of the TLM. In both lessons, the student-teachers put the pupils into small groups of seven members for effective teaching and learning. Pupils were given instructions on how they would use the TLM so that they could handle it with care. The TLM was introduced at the right time in the lesson and as a result, the lesson was participatory and interesting. The TLM was properly cleaned, and packaged.

Plate 43: *Testing of the Manipulative Solar System in lessons*

4.3.2 Test-Result of the Manipulative Solar System

Post lesson evaluation revealed that the TLM was very effective, appropriate, suitable, durable, attractive and interactive. The attractive nature of the TLM sustained learners' interest and stimulated them to contribute immensely throughout the lesson. In addition to this, its manipulative character enabled pupils to explore the planets to understand how they orbit the sun. The only negative issue raised about this TLM during the post lesson evaluation was that it is not suitable for a whole class demonstration, unless learners are clustered into group.

4.3.3 Testing of the Counting Tray and the Counting Materials

The testing of this TLM was done in Dormaa-Akwamu Methodist basic one and basic three. This TLM was purposely, designed to be used for teaching basic counting, addition and subtraction in basic one, but during the pre-lesson preparation, it was realized that it could be employed to teach colour identification, as well as ascending and descending order. As a result, the TLM was used to teach basic counting, addition and subtraction in class one; and colour identification in class three. In both lessons, the TLM was introduced at the needed time and used effectively.

Plate 44: *Testing of the Counting Tray and Counters in lessons*

Although, the TLM was not designed to teach ascending and descending order lesson, yet when the counting tray was employed to teach that topic in class three, the lesson was very interesting and effective. Pupils were motivated by the beautiful arrangement of the cylinders in ascending and descending orders; and they contributed immensely in the lesson.

Plate 45: *The use of Counting Tray to teach ascending and descending order concepts*

4.3.4 Test Result of the Counting Tray and Counting Materials

Post lesson review indicated that the materials were very attractive, suitable, interactive durable, and therefore very appropriate. Its versatility made it possible to be used for three different lessons, in two different subjects: mathematics and creative arts. Thus, the counting tray and the counting materials were used to teach basic counting, addition and subtraction in mathematics; and the counting tray was employed to teach ascending and descending order, and colour identification in mathematics and creative arts respectively. Again, after the ascending and descending order class, it was realized that, the counting tray could be used to teach the topic, 'perspective' in JHS, SHS and Colleges of education.

The downside of this TLM is that, it is very difficult to carry, arrange and pack. The TLM need to be set up before lessons; and after lessons, all the various components need to

be packed in their bags gently and carried home or office. The variety of the counting materials makes handling of this TLM quite cumbersome.

4.3.5 Testing of the 3D Human Digestive System

The evaluation of this TLM was done in Dormaa-Akwamu Methodist Primary School when teacher trainee used it in the integrated science lesson in basic four. In the human digestive System lesson, the TLM was introduced timeously and used effectively. Pupils were given instructions on how to use the TLM in the lesson. The labeling on the TLM, that can be attached and detached made the class very interactive and participatory. Names of parts of the human digestive system were detached and replaced by numbers. Pupils were then asked to identify names of the parts, and they were able to identify them correctly. The lesson ended successfully, and the TLM was encased accordingly.

Plate 46: *Testing of the 3D Human Digestive System in lesson*

4.3.6 Test-Result of the Human Digestive System

Post lesson evaluation resulted that, this TLM was very attractive, interactive, durable, flexible, suitable and appropriate for the lesson. The TLM was very captivating and pupils were eager to answer questions posed on them so that they would have opportunity to point part of the TLM with the cane. This made the lesson very interesting and livery as pupils attentions were sustained throughout the lesson. The only downside identified on this TLM was that, attaching and detaching of the parts can destroy the stickers that bears the names of parts of the body. However, these stickers do not cost so much and copy can be printed when needed; or they can be substituted by wring the names of the part on the masking tape.

4.3.7 Testing of the Manipulative 12-Point Colour Wheel

This TLM was tested in basic two of Dormaa Akwamu Methodist Primary School and basic four of Berekum Municipal Assembly Primary School. The two levels of classes were selected to evaluate the suitability of the TLM in teaching both lower primary and upper primary. In basic one, the TLM was used to teach basic colour identification whiles in basic four, it was used to teach colour mixing. In both lessons, pupils were captivated by TLM and they all contributed massively throughout the lesson. Both lessons were successful, and lesson objectives were attained.

Plate 47: *Using the Manipulative 12-Point Colour Wheel in lessons*

4.3.8 Test Result of the Manipulative 12-Point Colour Wheel

Post lesson discussions concluded that the TLM was very captivating, interactive, durable, versatile, suitable and appropriate for different levels of learners. Its manipulative quality enabled learners to touch, hold and feel individual colours to undergo all the learning experiences that resulted in the achievement of learning objectives. The TLM is easy to use and carry but the only downside of this TLM is that, it is not appropriate for a whole class discussion or demonstrations. To use it effectively, learners must be clustered into small groups.

4.3.9 Testing of the Pattern Making Cards

The evaluation of pattern making cards was done in basic two of Dormaa-Akwamu Methodist Primary and basic four of Berekum Municipal Assembly Primary School. In both lessons, pupils were expected to create patterns or designs with the cards provided. The teacher trainee demonstrated to the pupils how the 'L' and 'V' shaped cards could be arranged to create an interesting designs or pattern. Eventually, pupils were able to create exciting pattern using 'L' and 'V' shaped patterns.

Plate 48: *Pupils creating patterns with 'L' and 'V' cards during Creative Art lessons*

4.3.10 Test Result of the Pattern Making Cards

Upon lesson reflections by the researcher and the student-teachers, it was concluded that pupils were attracted by the pattern making cards and everyone was eager to have opportunity to create pattern or designs with the 'L' and 'V' shaped cards. As a result, the lessons were very participatory, interesting and very successful. The TLM was durable,

easy to use and versatile. Its versatility made it possible to be used in different levels of the learners. The only difficulty encountered on the use of this TLM was that, the cards were not enough to be distributed every pupil, so that they could all make their patterns simultaneously. In spite of this, the lesson was successful as learners were put into small groups for effective teaching and learning.

4.4 Research Question Four: What is the level of improvement on the TLMs produced by the student-teachers as compared to the previous ones used by students-teachers on the internship programme?

At the end of the training, student-teachers' knowledge and skills in TLMs design and production improved tremendously; and this can be seen when old (O) TLMs used by the student-teachers are placed side by side with the new (N) ones.

4.4.1 Comparing the Old (O) TLM, 'Solar System' With the New (N) One Produced By the Student-Tecahers

Plate 49 seeks to compare old TLM used by student teachers to teach 'solar system' with and the new TLM for teaching the same topic.

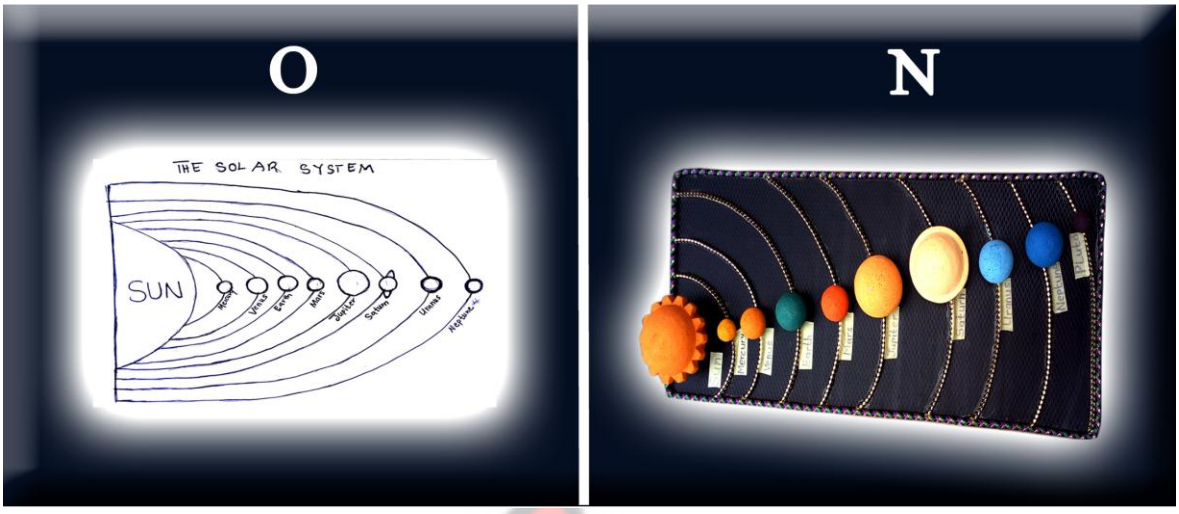

Plate 49: *The Old Solar System and the New One compared*

From plate 49, the new TLM is more appropriate than the old TLM because of the justifications provided in the table 12.

Table 12: Comparing the Old (O) TLM, 'Solar System' With the New (N) TLM produced by the Student-teachers

Some Negative Statements which make the Old TLM (O) Inappropriate (IA)	**Some positive statements which make the New TLM (N) Appropriate (AP)**
1. The old material is unattractive and cannot attract and sustain pupils' interest. Children are fascinated by bright colours but the old TLM was made of outline drawing without colour.	**1.** The new material is attractive and can attract and sustain pupils' interest. Children are fascinated by bright colours, therefore the new TLM was painted using worm colours.
2. The old material is not interactive and manipulative. Pupils cannot manipulate it to make lessons easy and participatory.	2. The new material is interactive and manipulative. Pupils can manipulate it to make lessons easy and participatory.
3. The old TLM is not durable and flexible. It cannot withstand manipulation and cannot last for longer period.	3. The new TLM is durable and flexible. It can withstand manipulation can last for longer period.

From table 12, the new TLM produced by the student-teachers is very attractive, manipulative, flexible, durable and therefore very appropriate and effective for teaching the topic 'the solar system' in primary schools; but the old TLM lacks these characteristics rendering it inappropriate. Acoording to Willard, Jeffrey and Steven (2008), young children are attracted by warm, bright colors. During testing of the new TLM, its colourful nature captivated pupils' attention throughout the lesson. When pupils were given the chance to manipulate it for effective understanding of the lesson, the material was able to withstand vigorous manipulations by the pupils. Based on these justifications, the researcher believes that the new TLM is very appropriate and effective than the old one.

4.4.2 Comparing the Old (O) 'Counting Materials' with the New (N) One

Plate 50 compares old counting materials with the new ones produced after the training; by placing the images of the two TLMs side by side. There was very wide difference between the two TLMs as seen from plate 50.

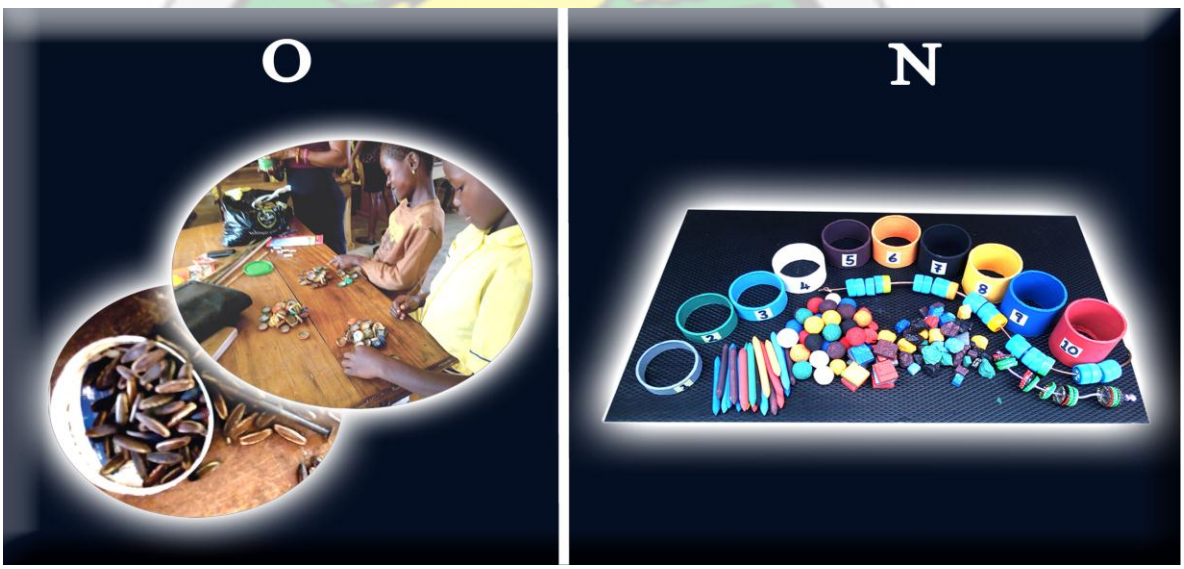

Plate 50: *The Old Counting Materials and the New One compared*

Table 13, further assigns reasons why new counting materials are appropriate and old counting materials are inappropriate.

Table 13: Comparing the Old (O) 'Counting Materials' with the New (N) One

Some Negative Statements which make the Old (O) TLM Inappropriate (IA)	**Some Positive Statements which make the New (N) TLM Appropriate (AP)**
1. The old counters are not colourful and therefore unattractive to pupils.	1. The new counters are brightly coloured and very attractive to pupils.
2. The old counters are not new to the pupils. Pupils' interests are not heightened when they see old objects in the classroom.	2. The counters are new to the pupils. Pupils' interests are heightened when they see new materials in the classroom.
3. Though the old counters are manipulative and interactive; yet, they lack variety. Monotony of material makes lesson boring.	3. The new counters are manipulative and interactive, and they were made of variety of materials, which make lessons interesting.

From table 13, the new counting materials are brightly coloured, and therefore very attractive than the old counting materials. Colour sways the way we see and process information; and it can improve our ability to remember both words and pictures (Myers, 2004). Colours can positively affect learners' cognitive retention (Dzulkifli and Mustafar, 2013). During the testing of the TLMs, pupils were very excited when the new counting materials were displayed; and this aided to arouse and sustain their interests in the lesson.

Since the counting materials were new to the pupils, they were eager to answer questions in order to get opportunity to manipulate the materials.

However, both old and new counting materials are manipulative, yet the old one lacks variety. Oppong et-al, (2009) believe that, for a teacher to enhance the quality and effectiveness of teaching and learning, he is bound to use a variety of instructional materials. According to Muilkiungu et-al, (2003) teachers should use variety of teaching and learning resources that are easily found within the locality. It is therefore the responsibility of the stakeholders to ensure that the required materials are provided to enhance learning of the pupils. Variety of materials used in the new counters make them more attractive, effective and appropriate for the lesson. On contrary, materials used for the counters in the old TLMs are mainly dry seeds and bottle tops which are very common to the pupils.

4.4.3 Comparing the Old (O) 'Human Digestive System' with the New (N) One

The new TLM in the Plate 51 demonstrates high level of skills attained by the trainees after the training. The new TLM is appropriate whiles the old one is inappropriate.

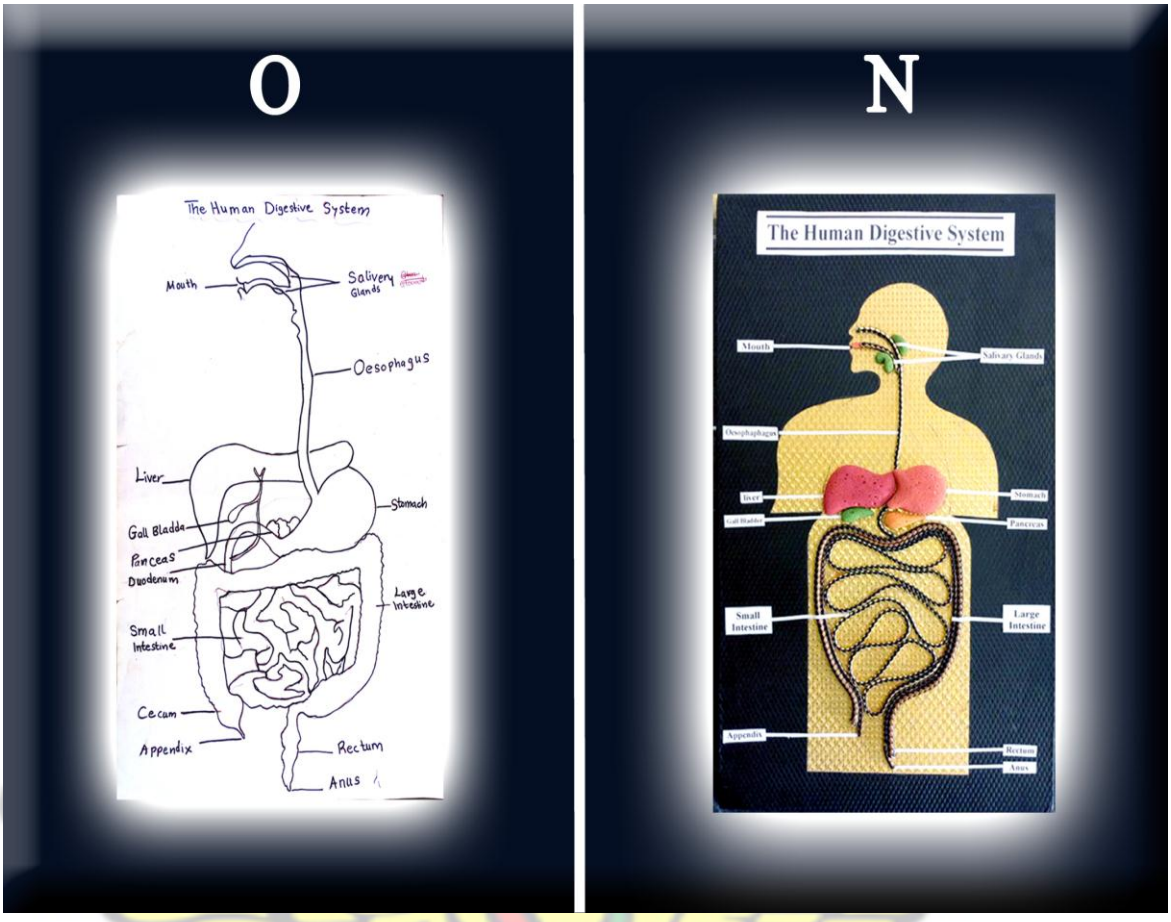

Plate 51: *Old Human Digestive System and New One compared*

Table 14 further outlines the reasons why the new human digestive system is appropriate and the old human digestive is inappropriate.

Table 14: Comparing the Old (O) 'Human Digestive System' with the New (N) One

Some Negative Statements which make the Old (O) TLM Inappropriate (IA)	Some Positive Statements which make the New (N) TLM Appropriate (AP)
1. The old TLM is unattractive and cannot attract and sustain pupils' interest.	1. The new TLM is very attractive and can attract and sustain pupils' interest.
2. The illustration and lettering in the old TLM are not clear to give a clear understanding of what is being taught.	2. The illustration and lettering in new TLM are very clear to give a clear understanding of what is being taught.
3. The old TLM is not interactive. Pupils cannot interact with the material to make the lesson livery and interesting.	3. The new TLM is interactive. Parts of the TLM can be detached and attached to make lessons livery and interesting.
3. The old material is not durable and flexible. It cannot withstand manipulation and cannot last for longer period.	3. The new material is durable and flexible. It can withstand manipulation and can last for longer period.

From table 14, the new digestive system produced by the student-teachers is very attractive, interactive, and durable, making it appropriate and effective. The old human digestive system on the other hand is unattractive, non-interactive, and not durable, its poor illustration and poor lettering make it inappropriate and ineffective. The materials used in lessons are most effective when they are at the appropriate level and relate closely to the topics of instruction (Hewlett Foundation, 2014; McEwan, 2013).

During testing of the new material, its interactive nature made the lesson very interesting and participatory. Cognitive research has shown that learning is most effective when four fundamental characteristics are present: these are active engagement, participation in groups, frequent interaction and feedback, and connections to real world contexts (Bransford, Brown, and Cooking, 1999). The durability nature of the new TLM enabled it to withstand active manipulations resulting in active lesson interactions, engagement and participatory. Based on these reasons, the researcher concludes that, the new digestive system produced by the student-teachers is very appropriate and effective.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Overview

This chapter presents the summary of the research work and major findings. Conclusions are drawn base on the findings, and recommendations are made for considerations by authorities such as National Council for Tertiary Education, Teacher Education Division of Ghana Education Service and Ministry of Education to help improve the quality and standard of teacher training and education as a whole.

5.1 Summary of Main Findings

The study aimed at uncovering deficiencies and inefficiencies on the use of TLMs by student-teachers of St. Ambrose College of Education; and equipping them with requisite knowledge and skills for TLMs design and production. The research design employed in this study was qualitative, and the method used in conducting the study was action research. The target population for the study was 360 student-teachers which constituted the entire student population of St. Ambrose College of Education-Dormaa Akwamu. The accessible population for the study was 90 student-teachers, consisting of 60 second year visual art student-teachers and 30 final year student-teachers on practicum. The 60 student-teachers were selected based on convenience sampling while the 30 student-teachers were reached using purposive sampling.

Participant observations and one-on-one interview were the research instruments used, and the major finding was that student-teachers lacked knowledge and skills on the TLMs design and production. Student teachers were then equipped with the needed

knowledge and skills for TLMs design and production through training. The outcome of this training was massive, and six new TLMs were produced and they were tested by using them in real classroom lessons. The test-results of all the six TLMs were positive as they were appropriate and effective for the lessons. Student-teachers who undertook the training acquired the requisite knowledge and skills in TLMs selection, design, production and utilization. The following are highlights of major findings.

- **Student-teachers lack requisite knowledge and skills in TLMs design and production:** As a result of this, student-teachers resort to chalkboard illustration. Those who used TLMs in their lessons either employed inappropriate or unattractive materials. TLMs used by student-teachers were not interactive, and the few who used interactive materials did not vary their TLMs, and this resulted in monotony of material which made their lessons boring.
- **Major Challenges/Difficulties that Student-Teachers Face in Making TLMs:** All student-teachers interrogated knew the essence of TLMs, and hence the need to use them in lessons. Student-teachers revealed that, lack of finance to purchase tools and materials for making TLMs, coupled with lack of skills on TLMs design and production discouraged them from making their own materials. In addition to this, since student-teachers lack basic skills in TLMs design and production, they spend a lot of time in making their own TLMs. They think that designing and producing their own materials is time consuming.
- **Common Faults Detected on Student-Teachers' TLMs:** The following are common faults found on student-teachers TLMs: they are difficult to handle, paste or hang; they are not durable and flexible; they show poor drawing and lettering;

and finally they are not attractive. These characteristics make their TLMs inappropriate and ineffective for lessons.

- **Remedial Work on Basic Drawing and Lettering was Conducted for Student-Teachers:** The basic drawing and lettering lessons equipped student-teachers with good drawing and writing skills, and these are very useful in TLMs design and production. Trainees' works showed tremendous improvement in drawing and lettering.
- **Trainees were Equipped with the Requisite Skills for TLMs Design and Production:** The training conducted for the student-teachers on TLMs design and production equipped them all the needed skills on TLMs design and production. The new TLMs produced at the end of the training were appropriate and effective for the lessons as compared to the old ones used by student-teachers on practicum. This indicates that learners have acquired skills that would help them to design and produce appropriate materials for their lessons.
- **Trainees Acquired Strategies for Using TLMs Effectively in Lessons:** Testing of the TLMs in lessons acquainted student-teachers with the technique of using TLMs effectively in lesson. In pre-lessons preparations, student teachers were taught how to use TLMs in lessons and as a result, they were able to use them effectively. Post-lessons evaluations also provided student-teachers with the criteria for evaluating the effectiveness of the TLMs. Knowledge gained here would enable them to assess their TLMs effectively before, during and after lessons.

5.3 Conclusions

1. Student-teachers cannot design and produce appropriate TLMs for their lessons, as they lack the requisite knowledge and skills in TLMs design and production.
2. Knowledge, skills and experiences that student-teachers acquire from Fundamentals in Visual Art (FVA-111) are not enough to enable them design and produce their own TLMs.
3. Student-tecahers are not motivated to design and produce their own TLMs.
4. Students-teachers do not use appropriate and suitable TLMs in lessons, and this can result in uninspiring, uninteresting, boredom and not interactive lessons.
5. Training of Student-teachers on TLMs design and production enable student-teachers to produce appropriate TLMs for effective teaching and learning.

5.4 Recommendations

1. Skills development in TLMs selection, design, production and utilization should be integrated into the Visual Art Programme at Colleges of Education in Ghana. National Council for Tertiary Education and other appropriate authorities should consider this issue.
2. Visual Art should be considered as core or general course in the Curriculum of Colleges of Education, so that trainees would have enough contact hours to learn the desired learning experiences. National Council for Tertiary Education and other appropriate authorities should consider it.
3. Student-teachers should be provided with both material/technical supports so that they would be motivated to design their own TLMs.

4. Conscious efforts should be made by the art tutors in colleges of education so as to instill in the student-teachers the skills in drawing, lettering, designing and creativity that are necessary in TLMs design and production, in spite of the limitations in the contact hours.
5. Finally, student-teachers should be encouraged and supported to produce and utilize appropriate TLMs to make lessons more enjoyable, very motivating and interactive. Periodic and intensive training of student-teachers on TLMs design and production can help to achieve it.

5.5 Recommendations for Further Studies

In the process of gathering pertinent information for this study, as well as the research findings exposed the researcher to two other important areas or topics which could be further studied.

- **Investigating into the reasons why most basic school teachers do not teach the creative art subject**. This issue came up when the researcher realized that none of the thirty student-teachers observed in the classroom taught the creative art subject. The researcher discovered that even teachers on the field have difficulties in teaching the creative art. The researcher therefore recommends a further study into why basic school teachers do not teach creative art subject in primary schools.
- **Integrating TLMs design and production into the Curriculum of Colleges of Education.** In order for student-teachers to acquire requisite knowledge and skills for TLMs selection, design, production and utilization, the researcher proposes a further investigation into the curriculum of colleges of education in Ghana. The

researcher therefore recommends a further study into how the knowledge and skills in TLMs selection, design and utilization could be integrated into the curriculum of Colleges of Education in Ghana.

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APPENDIXES

Appendix A: Observation Guide

The purpose of this observation is to find out how student-teachers on teaching practice use TLMs effectively in lessons. In order to ascertain the proficiency of students-teachers on TLMs selection, design, production and utilization, the following questions were formulated as observation guide:

1. Do student-teachers utilize TLMs in lessons?
2. Are the TLMs appropriate or suitable for the lesson?
    i. Are the TLMs attractive to capture and sustain pupils' interests?
    ii. Are the TLMs interactive or manipulative to promote learners participation?
3. Do student-teachers use variety of TLMs?
4. How effective are the TLMs in the lesson?
5. How do student-teachers use chalkboard illustration?
6. How do student-teachers demonstrate knowledge and skills on TLMs selection, design, production and utilization?

APPENDIX - B

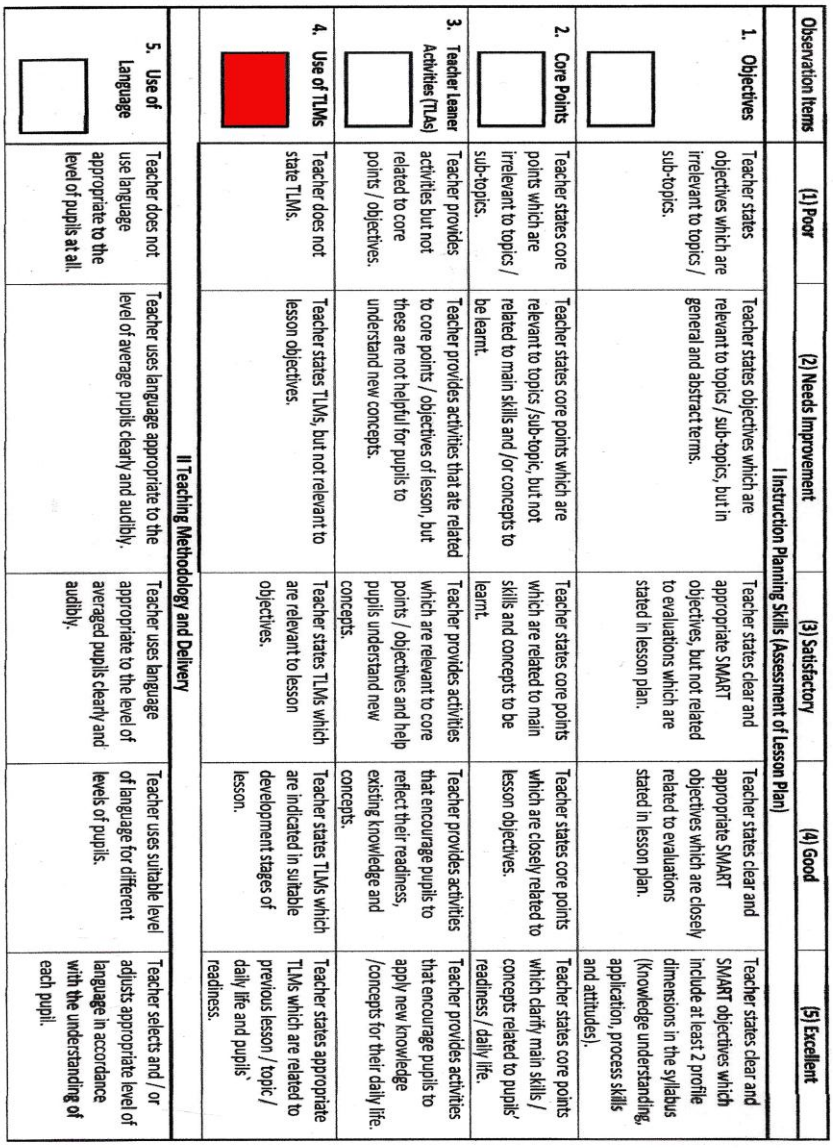
Interviews Guide

In order to investigate the capabilities, difficulties or challenges that student-teachers encounter in TLMs design and production, the following questions were formulated to serve as an interview guide:

1. Do you use teaching and learning materials in your lessons?
2. Do you design them on your own?
3. What challenges / difficulties do you encounter in TLMs design and production?
4. What specific skills do you lack in TLMs design and production?
5. Are your TLMs appropriate and effective for your lessons?
6. What are common faults on your TLMs?

APPENDIX – C

University of Cape Coast Assessment Criteria for Teaching Practice in the Colleges of Education in Ghana



ST. AMBROSE COLLEGE OF EDUCATION
TEACHING PRACTICE UNIT
TEACHING PRACTICE ASSESSMENT FORM A

NAME OF STUDENT:.....INDEX NO:.....DATE:.....

SCHOOL OF PRACTICE:.....FORM/ CLASS:.....

SUBJECT:.....TIME:.....

LESSON TOPIC:.....

Observation Items	(1) Poor	(2) Needs Improvement	(3) Satisfactory	(4) Good	(5) Excellent
I Instruction Planning Skills (Assessment of Lesson Plan)					
1. Objectives	Teacher states objectives which are irrelevant to topics / sub-topics.	Teacher states objectives which are relevant to topics / sub-topics, but in general and abstract terms.	Teacher states clear and appropriate SMART objectives, but not related to evaluations which are stated in lesson plan.	Teacher states clear and appropriate SMART objectives which are closely related to evaluations stated in lesson plan.	Teacher states clear and SMART objectives which include at least 2 profile dimensions in the syllabus (Knowledge understanding, application, process skills and attitudes).
2. Core Points	Teacher states core points which are irrelevant to topics / sub-topics.	Teacher states core points which are relevant to topics /sub-topic, but not related to main skills and /or concepts to be learnt.	Teacher states core points which are related to main skills and concepts to be learnt.	Teacher states core points which are closely related to lesson objectives.	Teacher states core points which clarify main skills / concepts related to pupils' readiness / daily life.
3. Teacher Leaner Activities (TLAs)	Teacher provides activities but not related to core points / objectives.	Teacher provides activities that ate related to core points / objectives of lesson, but these are not helpful for pupils to understand new concepts.	Teacher provides activities which are relevant to core points / objectives and help pupils understand new concepts.	Teacher provides activities that encourage pupils to reflect their readiness, existing knowledge and concepts.	Teacher provides activities that encourage pupils to apply new knowledge /concepts for their daily life.
4. Use of TLMs	Teacher does not state TLMs.	Teacher states TLMs, but not relevant to lesson objectives.	Teacher states TLMs which are relevant to lesson objectives.	Teacher states TLMs which are indicated in suitable development stages of lesson.	Teacher states appropriate TLMs which are related to previous lesson / topic / daily life and pupils' readiness.
II Teaching Methodology and Delivery					
5. Use of Language	Teacher does not use language appropriate to the level of pupils at all.	Teacher uses language appropriate to the level of average pupils clearly and audibly.	Teacher uses language appropriate to the level of averaged pupils clearly and audibly.	Teacher uses suitable level of language for different levels of pupils.	Teacher selects and / or adjusts appropriate level of language in accordance with the understanding of each pupil.

NOTE: Observation Item 4, marked red emphasizes on the need of the student-teachers to use TLMs in lessons

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APPENDIX - C

University of Cape Coast Assessment Criteria for Teaching Practice in the Colleges of Education in Ghana

Observation Items	(1) Poor	(2) Needs Improvement	(3) Satisfactory	(4) Good	(5) Excellent
			II Teaching Methodology and Delivery		
6. Introduction to the lesson	Teacher barely introduces the lesson.	Teacher introduces the lesson but does not review students' RPK	Teacher introduces the lesson, reviews students' RPK and links it up with topic.	Teacher introduces the lesson, reviews students' RPK, links it up with topic and shares lesson objectives with students.	Teacher connects content and students' RPK appropriately. Explores RPK and student interest and shares lesson objectives with students.
7. Use of Generic skills	Teacher does not make use of generic skills.	Teacher makes use of generic skills that are not related to pupils' learning activities and lesson objectives.	Teacher makes use of generic skills related to pupils' learning activities and lesson objectives.	Teacher puts pupils' knowledge of generic skills into practice appropriately.	Teacher encourages pupils to acquire the generic skills, and pupils can solve problems with generic skills by themselves.
8. Subject and pedagogical knowledge	Subject matter is disorganized	Teacher demonstrates knowledge of topic and presents concepts and issues but not clearly and logically.	Teacher presents concepts and issues logically and clearly and provides expected answers to sample questions in lesson plan	Teacher presents concepts and issues logically and clearly, uses precise vocabulary/technical terms. States expected answers.	Teacher demonstrates relevant subject knowledge linked to objectives, uses a variety of techniques to ensure active student participation.
9. Teacher behaviour	Teacher lacks enthusiasm in teaching. Does not appear well-groomed in speech, dressing and punctuality.	Teacher shows evidence of enthusiasm for teaching, appears well-groomed in speech, dressing and punctuality.	Teacher dresses consistently with acceptable professional standards, can assess and handle situation situations objectively and explain rational for decisions. Shows discretion	Teacher demonstrated a variety of strategies to develop rapport with students. Models acceptable behavior. Provides clear direction for classroom activities	Teacher is creative and innovative. Exhibits appropriate professional conduct (decorum in speech, behaviour and mannerism.
10. Pace of lesson and audibility of voice	Teacher speaks too fast/slow	Pace is appropriate but voice is not audible from back of the class	Pace is appropriate some of the time and voice is audible from back of the class.	Pace is appropriate most of the time and voice is audible from back of the class.	Pace is appropriate for the entire lesson and all students can hear the teacher clearly.
11. Use of Chalkboard	Teacher does not use a chalkboard	Writing on the chalkboard is in appropriate size, color strength and clear.	Writing on the chalkboard is well-planned with letters, figures and illustrations which are formed neatly and correctly	Writing on the chalkboard is systematically planned and logically organized.	Chalkboard is systematically used to summarize all of important or core points of lesson enough for pupils to understand lesson.
12. Questioning Skills	Teacher does not ask questions at all in lesson.	Teacher asks only low order (recall) and rhetorical questions such as yes-or-no questions.	Teacher asks well-balanced low / high order questions, pauses and calls on volunteers to respond.	Teacher asks low / high order questions which promote higher order responses and encourages even non-volunteers to respond or ask questions.	Teacher asks low / high order questions. One at a time and sequenced in order of difficulty which is suited to the level of pupils.

NOTE: Observation item 11, marked red relates to the use of TLMs
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APPENDIX - C

University of Cape Coast Assessment Criteria for Teaching Practice in the Colleges of Education in Ghana

Observation Items	(1) Poor	(2) Needs Improvement	(3) Satisfactory	(4) Good	(5) Excellent
			II Teaching Methodology and Delivery		
13. Feedback to pupils	Teacher does not offer feedback to pupils' responses at all.	Teacher offers feedback to pupils' responses but simply tells pupils if their answers are right or wrong.	Teacher offers feedback to pupils' response that promotes further or better understanding in lesson.	Teacher gives supportive feedback to pupils who made a wrong response and uses the response to promote better understanding.	Teacher offers feedback to pupils' responses that promote active and mutual learning among pupils.
14. Use of TLMs	Teacher does not use any TLMs in lesson.	Teacher uses TLMs, but not relevant to lesson objectives.	Teacher uses TLMs which are relevant to lesson objectives at appropriate stages in lesson.	Teacher uses TLMs which are stimulating and attractive for pupils and makes pupils to use them actively.	Teacher uses TLMs which are relevant to pupils' previous lesson / topic / daily life and readiness and makes pupils to understand new concepts and pose / solve problems through TLMs.
15. Pupils' Participation	Teacher keeps talking without involving pupils.	Teacher introduces activities which arouse pupils' interests but demonstrates them by teacher him/her.	Teacher introduces activities, and pupils participate in it actively and with interests.	Teacher introduces activities that equip pupils with generic skills through problem solving (Teacher initiates Inquiry-based learning).	Teacher introduces activities that promote mutual leaning among pupils and initiates collaborative inquiry-based learning).
16. Use of Teacher Learner Activities (TLAs)	Teacher uses activities but not related to core points / objectives of lesson.	Teacher uses activities that are related to core points / objectives of lesson, but these are not helpful for pupils to understand new concept.	Teacher uses activities which are relevant to core points / objectives and help pupils understand new concepts.	Teacher uses activities that encourage pupils to reflect their readiness, existing knowledge and concepts.	Teacher uses activities that encourage pupils to apply new knowledge / concepts for their daily life.
17. Evaluation of Lesson	Teacher makes no evaluation of lesson.	Teacher assesses pupils' knowledge / understanding during the lesson, but the assessment is not related to objectives of lesson.	Teacher assesses pupils' knowledge / understanding during the lesson which are related to objectives of lesson.	Teacher assesses pupils' understanding during lesson (formative assessment) and restructures the development of lesson based on the result of evaluation of pupils' understanding.	Teacher assesses pupils' readiness / understanding /achievement in the lesson using appropriate questions based on at least 2 profile dimensions in syllabus (knowledge, understanding, application, process skills and attitudes).

NOTE: Observation Item 14, marked red emphasizes on the need of the student-teachers to use TLMs in lessons

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APPENDIX - C

University of Cape Coast Assessment Criteria for Teaching Practice in the Colleges of Education in Ghana

Observation Items	(1) Poor	(2) Needs Improvement	(3) Satisfactory	(4) Good	(5) Excellent
III. Classroom Organization and Management					
18. Classroom Setting	Teacher does not arrange classroom to provide lesson.	Teacher arranges a classroom for lesson / activities, but pupils are not well organized.	Teacher arranges a classroom to suit activities at the beginning of lesson and gets pupils well organized.	Teacher arranges a classroom as planned to suit activities before starting lesson in advance.	Teacher arranges a classroom to suit a variety of activities appropriately, timely and in the right place, and classroom arrangement is well organized.
19. Class Control	Teacher allows pupils to do whatever they want.	Teacher constantly orders pupils on what to do.	Teacher sometimes communicates to pupils on what to do and ensure the order in classroom.	Teacher and pupils communicate with each other and ensures good atmosphere for teaching and learning in class	Pupils cooperate with each other in making the class orderly and ensures good atmosphere without teachers' control.
20. Closure	The bell announces end of the lesson and teacher finishes lesson abruptly/teacher finishers lesson well ahead of time.	Teacher ends the lesson without completing evaluation of the lesson.	Teacher uses questioning, summary and/or practice to end the lesson and links it with lesson objectives (s) is/are not achieved.	Teacher uses questioning, summary and /or practice to end the lesson links it with lesson objectives(s). Lesson objective (s) is/are achieved.	Teacher draws attention to end of the lesson, helps students to consolidate/reinforce major points learned. Lesson objective(s) is/are achieved. Teacher assigns activity for next lesson.

TOTAL SCORE ☐ GRADE ☐ Overall comments:

Name of Supervisor: .....

Signature: .....

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