

Addis Ababa University School of Graduate Studies

**Assessment of the Availability and Utilization of Instructional
Materials for Physics Instruction at the Second cycle of
Selected Secondary Schools in West Shoa Zone of Oromia
Regional State**

**By
Tesfaye Yadata**



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**June, 2008
Addis Ababa**

Addis Ababa University School of Graduate Studies

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**A Thesis Submitted To the School of Graduate Studies of Addis
Ababa University in Partial fulfillment of the Requirements for
the Degree of Master of Arts in Curriculum and Instruction**

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Addis Ababa University School of Graduate Studies

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Table of Contents

	Page
Acknowledgement.....	i
Acronyms	ii
Abstract.....	iii
CHAPTER ONE.....	1
1. Introduction	1
1.1. Background of the study.....	1
1.2. Statement of the Problem	4
1.3. Objectives of the Study.....	5
1.4. Significance of the Study	5
1.5. Delimitation of the study	6
1.6. Limitation of the study	6
1.7. Operational Definitions or Related Terms.....	7
CHAPTER TWO	8
2. Review of the Related Literature	8
2.1. The Meaning of Instructional Materials.....	8
2.2. Classification and Types of Instructional Materials.....	11
2.3. Importance and Need for Instructional Materials.....	15
2.4. Principles for the Use of Instructional Materials	22
2.5. Physics Instruction and Instructional Materials	28
2.6. The Physics Laboratory	30
2.7. Availability and Production/ Improvisation of Instructional Materials.....	32
2.7.1. Selecting Learning Materials.....	32
2.7.2. Production (Improvisation) of Instructional Materials	35
2.8 Utilization of Instructional Materials to Enhance the Quality of Teaching and Learning in Physics	39
2.8.1. Utilization of Print Media	40
2.8.2. Utilization of Symbolic, Graphic Types of Media.....	41

2.8.3. Utilization of Three- Dimensional, Real Object.....	41
2.9. Major Stumbling-blocks Facing the use of Instructional Materials.....	42
CHAPTER THREE.....	46
3. Research Design and methodology	46
3.1. Research Design	46
3.2. Population and Sampling Strategy	47
3.3. Research Context or Setting	46
3.4. Data Gathering Instruments	48
3.4.1. Questionnaire.....	48
3.4.2. Interview and Observation Checklists	49
3.4.3. Validation of Instruments	49
3.4.4. Method of Data Analysis	49
CHAPTER FOUR.....	50
4. Analysis, Interpretation and Discussion of Data.....	50
CHAPTER FIVE	96
5. Summary, Conclusion and Recommendations	96
5.1. Summary	96
5.2. Conclusion	98
5.3. Recommendations	100
5.3.1. Inadequacy of Instructiounal Materials (IMS)	100
5.3.2. Shortage of Physics Kits and Laboratory Equipment.....	100
5.3.3. Utilization of IMS	100
5.3.4. Training.....	100
5.3.5. Production of IMS.....	101
5.3.6. Budget, Financial and Material Support for SPCs	101

Bibilography

- Appendix A
- Appendix B
- Appendix C
- Appendix D
- Appendix E

List of Tables

	Page
Table 1: Research settings and the participants of the study.....	53
Table 2: Basic Demographic Information about the Respondents ..	57
Table 3: Teachers Perception on the Importance of Commonly used Instructional Material for Physics Instruction.....	59
Table 4: Availability of Commonly used Instructional Materials as Acknowledged by Physics Teachers from the Sample Schools (N=30)	60
Table 5: Responses of Teacher Respondents on the Availability of Kits.....	63
Table 6: Teachers Extent of use of the available IMS in Physics instruction	63
Table 7: Use of Physics Lab by Physics Teachers To Provide Learners with First Hand Experience	65
Table 8: Responses of Teachers for not Using Physics Lab	66
Table 9: Adequacy of Equipment in Physics Laboratories	67
Table 10: Inadequacy of lab Equipments	69
Table 11: Availability of the Basic Utilities Necessary for Physics lab to Operate	70
Table 12: Training opportunity for physics teachers to enable them to produce and use IMS	71
Table 13: Teachers evaluation of advantages they gained from Training opportunities such as workshops or seminars..	72
Table 14: Teachers involvement in the production of IMS to enhance physics instruction	73
Table 15: Ratings of SPC Coordinators Cooperating in Producing IMS as Rated by Physics Teachers.....	75
Table 16: Extent of teachers' evaluation of SPC contribution in improving the teaching-learning process.....	76

Table 17: School directors support and encouragement for the production and utilization of IMS as reacted by teacher respondents	77
Table 18: Frequency of Assigning Students to Produce IMS by Physics Teachers	78
Table 19: Major Stumbling Blocks Confronting Physics teachers while making use of IMS for physics instruction.....	79
Table 20: Conditions of SPCs: are they fully operational?	80
Table 21: The current status of school Physics lab	81
Table 22: Adequacy of IMS at the sample schools as evaluated by Physics teachers	82
Table 23: Teacher attitude towards the benefits of IMS in instruction.....	84
Table 24: Adequacy of Training SPC coordinators received to provide appropriate services to the users of SPC	86
Table 25: Financial and material support received by SPCs so that they may function effectively	87
Table 26: Availability of budget for SPC for the purpose of producing and utilizing IMS	88
Table 27: Types of services SPCs provide.....	89
Table 28: Highlights the responses offered by both the school directors and SPC coordinators.....	90
Table 29: Use of SPCs by physics teachers for the production of IMS in the eyes of SPC coordinators.....	91
Table 30: problems SPC coordinators encounter in producing IMS..	92
Table 31: Attitudes of SPC coordinators towards IMS.....	93
Table 32: Use of locally available materials for physics instruction by physics teachers as observed by school directors	94
Table 33: Use of IMS by Physics teachers as supervised by school directors.....	95

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Acronyms

EPS	-	Ethiopian Physical Society
ETPE	-	Education and Training Policy of Ethiopia
IMS	-	Instructional Materials
NCET	-	National Council on Educational Technology
SPCS	-	School pedagogical centers.
VCRS	-	Video Cassette Recorders
STS	-	Science, Technology and Society

Abstract

Prompted by the growing concern about the problems the provisions of quality Physics instruction encounter due to shortage of Instructional Materials, the researcher conducted this study to assess the Availability and Utilization of Instruction Materials for Physics instruction at the Second cycle of selected secondary Schools in West Shoa Zone of Oromia Regional State. Both Qualitative and quantitative approaches particularly, a descriptive survey were employed as they were found to be appropriate for answering the basic research questions. Instruments of data collection included questionnaires, interviews and observation checklist. Pertaining to the sample population for the study, Physics teachers, Students, SPC Coordinators and School directors were involved. The results indicate that there is a general Unanimity in the views of Physics teachers and SPC Coordinator as regards the benefits derived from the use of IMS for better instruction. According to the findings of the study, Physics laboratories are inadequately equipped to such an extent that their practical utility is too much limited. The results also revealed serious shortage of IMS at the sample schools in West Shoa Zone. Problems of budget, financial and material support to keep SPCS functioning were identified besides. Most teachers neither used nor produced IMS, as uncovered by the findings of the study. Furthermore, the study revealed evidence of lack of training both for Physics teachers and SPC coordinators at the sample schools selected for the study. Use and production of IMS should become mandatory for all Physics teachers for the sake of quality Physics instruction. To this end, School directors and other concerned education authorities have to make all the necessary provisions, no matter however modest it may be. The present conditions of Physics labs and SPCS at the selected sample Schools in West Shoa Zone Should be improved urgently since without them effective instruction is inconceivable. Training for both physics teachers and SPC coordinators is urgently needed. Hence, due attention and serious consideration should be given to address the issue.

CHAPTER ONE

1. Introduction

1.1. Background of the Study

Instructional materials are tools that teachers use to implement a particular learning task by enriching the instructional strategy employed. In line with this point of view, Reinhartz (1997:145) argues that instructional materials come in several forms and provide students with a variety of learning experiences that can introduce, explain, reinforce and/ or review concepts presented. Hence, when instructional materials are used for the teaching of any subject, the bottom line is that learning will be effective and efficient. That is why it is commonly believed that quality education without the use of instructional materials is unthinkable or may not produce the desired effect.

Heinich. et. al., (1996:7) also describe instructional materials as tools used for engaging students powerfully in the learning process. By the same token, Amare (1999:53) pointed out that instructional materials relate to all forms of materials with which students and teachers interact for the purpose of learning-teaching. They are the instruments with which a teacher teaches and from which students learn. Amare (1999) further argued that no one disputes the role and function of instructional materials in enhancing quality education.

According to Sivertsen (1993), cited in Reinhartz and Beach (1997:307), learning with materials and hands-on experiences makes science concrete and relevant for students, which in turn allows them to construct meaning by piecing together bits of information.

Teaching with a variety of materials takes time and is often demanding, but the results are gratifying: students remember what they do (Rosanne Fortnor, Cited in Haury and Rillero, 1992).

Instructional materials have got several names such as audio visual aids, audiovisual material, audio visual media, communication technology, educational or instructional media and learning resources (Aggrawal, 2001:152). In actuality educators believe that all mean the same thing.

Instructional materials can be: models, specimens, simulators, objects- those that allow physical involvement of learners; or abstract-those that allow imaginative involvement of learners with a minimum effect of physical involvement or sensory involvement (with written or spoken words), (Amare, 1999).

According to Rao (1995:131), teaching aids are required by a physics teacher for effective teaching of the subject and to realize various objectives of teaching physics. Rao (1995) further argued, that teaching aids help the teacher to communicate with his students in a more desirable and effective way.

Teachers, like doctors and other skilled professional workers, need essential tools to do their work best (Brown et. al, 1985, P.19).

There is little doubt that teachers are well aware that how much appropriate IMS influence teaching and the quality of learning in the classroom. Hence, not only the ready availability of IMS but also the production of IMS should be the primary concern of all teachers in general, and of physics teachers in particular. Apparently active learning is a situation in which actual teaching-learning takes place. Thus drawing upon some ingenuity, teachers and students may create simple tools from free or inexpensive materials for the active learning of physics. With regard to this view, Ericson (1965) asserts that even though teachers may not have the necessary instructional materials at their fingertips, they need to strive to produce or improvise their own from locally available materials in collaboration with their students for the sake of quality teaching and learning.

As regards the advantage gained from the use of IMS, Aggrawal (2001:153-154) points out that audiovisual aids provide significant gains in informational learning, retention and recall, thinking and reasoning, activity, interest, imagination, better assimilation and personal growth and development.

Instructional materials prove effective only when they suit the teaching objectives and unique characteristics of a particular group of learners. As regards this issue Aggrawal (2001) notes the following points:

1. Principle of selection

- IMS should suit the age-level, grade level, and other characteristics of learners.
- They should have specific educational values besides being interesting and motivating.
- They should help in the realization of desired learning objectives.

2. Principle of preparation

- As far as possible, locally available materials should be used in the preparation of IMS.
- Teachers should receive some training in the preparation of IMS
- Not only teachers but also students should be engaged in the production process.

3. Principle of proper presentation

- Teachers should carefully visualize the use of teaching aids before their actual presentation.
- They should fully acquaint themselves with the use with the use and manipulation of the IMS to be shown in the classroom.
- The aids should be displayed properly so that all the students are able to see it observe it and derive maximum benefit out of its.

4. Principle of response

This principle demands that the teachers guide the students to respond actively to the audio- visual stimuli so that they derive optimum benefit in learning, (pp. 158-159)

1.2. Statement of the Problem

In order to impart effective physics instruction, instructional materials (IMS) are quite indispensable. They are both tools for teaching and avenues for learning in that they can crystallize ideas and clarify certain concepts of physics like speed, force, heat, temperature, etc., for example. In substantiation of the indispensability of instructional materials for effective teaching/ learning, the education and training policy document of Ethiopia (ETPE) (1994:28) states that:

Due attention will be given to popular participation, in the production, distribution, utilization, upkeep, care and safety of educational materials, educational technology and facilities.

Suffice it to say, therefore, prompted by the increased concern about the pressing problems the provision of quality physics instruction confronts due to shortage of instructional materials (IMS), the researcher conducted this study to assess the availability and utilization of IMS for physics instruction at the second cycle of selected secondary schools in West Shoa Zone of Oromia Region.

The basic research questions are:

1. Are there adequate instructional materials at the school?
2. How often do teachers use the available materials to make learning concrete and relevant for the students?
3. Does the pedagogical center at the school have a trained coordinator, adequate financial support and facilities to produce physics instructional materials?
4. Do physics teachers in conjunction with their students improvise teaching materials for physics instruction?

5. Do school principal and other concerned authorities at the schools provide the necessary support to encourage teachers and pedagogical center coordinators for the improvisation of physics teaching materials?
6. What attitudes do physics teachers at the schools have towards producing and utilizing instructional materials?

1.3. Objectives of the Study

The objectives of the study are to:

- Check the adequacy of instructional materials at the schools selected for the study.
- Explore how often physics teachers use the available IMS to make learning effective
- Assess the status of school pedagogical centers at the sample schools included in the study.
- Determine whether physics teachers and students produce instructional materials for physics instruction.
- Look into the support and encouragement provided by school directors and concerned authorities for the production of IMS, and finally, to see the attitudes physics teachers have towards the use of IMS.

1.4. Significance of the Study

1. Inasmuch as preparatory program has commenced recently, the study will provide a revealing insight into the present reality of physics instruction with respect to the availability and utilization of IMS at the preparatory schools selected for the study
2. The findings of the study will prove helpful to all stake-holders: government, non- government and the community to take necessary measures for improving the quality of physics teaching at the preparatory level of the schools.

3. The study will initiate teachers and the learners into improvising instructional materials from locally available materials for the provision of quality physics education
4. Suggestions and recommendations given as regards the study will alleviate problems arising from shortage of instructional materials to a certain magnitude.
5. The results of the study on the topic in question will add something to the literature concerning the provision of necessary instructional materials for physics instruction at preparatory school level.
6. The findings of the study based on the selected sample schools will reflect the real situations of the rest preparatory schools with respect to quality physics instruction in West Shoa Zone.

1.5. Delimitation of the study

The study is specifically concerned with the physics instruction at the second cycle of secondary schools in West Shoa Zone.

To conduct a study that includes all preparatory schools in Shoa Zone as a whole would be beyond the scope of the research study because of limited time, money and other necessary resources. Hence, the boundaries of the study is confined to a selected six preparatory schools found in selected six woredas of West Show Zone.

1.6. Limitation of the study

Time constraint was seen as the major limiting factor since it is very hard to combine study with a full-time job for the researcher himself is a full-time worker. More often than not school directors were preoccupied with meetings which made it difficult for the researcher to catch their full attention in order to suit his purpose well. Another doubly difficult limiting factor was financial constraint. The small size of the sample is also a limitation that deserves

mention here. Locating SPC coordinators to discuss matters concerning SPCs was additional limitation of the study since most of the SPCs at the selected sample schools were nominal or closed down.

1.7. Operational Definitions of Related Terms

For clarity's sake the terms that follow are defined according to the context they were used in this study.

Preparatory school: refers to grades 11 and 12 at the second cycle of secondary school.

Preparatory students: in this context means grades 11 and 12 science students who take physics courses.

School directors: refers to both principles and deputy directors of preparatory schools.

Utilization: refers to planning, selecting, preparing and using IMS by physics teachers for physics instruction.

CHAPTER TWO

2. Review of the Related Literature

In this chapter the review of related literature, which examines the current theoretical perspectives on instructional materials, will be discussed. In the context of the study, this chapter consists of eight parts in which the first part is about the Meaning of Instructional Materials, the second about Classification and Types of Instructional Materials, the third about Importance and Need for Instructional Materials, the fourth about Principles for the use of Instructional Materials, the fifth about Physics Instruction and Instructional Materials, the sixth, seventh and eighth parts respectively concern the Availability and Improvisation of Instructional Materials the Utilization of Instructional Materials to Enhance the Quality of Teaching and Learning in Physics, and the Major Stumbling- blocks confronting the use of Instructional Materials.

2.1. The Meaning of Instructional Materials

Owing to the fact that there has not been standardized definition of instructional materials, the meanings of many terms are not agreed upon by every one. Educators, however, now often refer to it educational communications technology, audiovisual media, learning resources, instructional media, educational media or new educational media to describe the field. Because of this, professionals may refer to any of these terms and others to mean the same thing and use them synonymously or interchangeably.

In reference to this, Armsey, (1973), concisely gives the definition of instructional materials as: the things of learning (p.1). In a similar fashion, Schramm, (1977), says that instructional materials are nothing but are the media of communication used for teaching and learning (p.12). Amare (1999:53), asserts that instructional materials relate to all forms of materials with which students and teachers interact for the purpose of learning and

teaching. Amare (1999) further points out that instructional materials are the instruments with which a teacher teaches and from which students learn. He went on to say that teaching without instructional materials boils down to teaching without technology. The materials, according to Amare (1999) can be concrete involve models, specimens, simulators, objects involving those that allow physical involvement of learners, or abstract- those that allow imaginative involvement of learners with a minimum effect of physical involvement or sensory involvement (learning with written or spoken words).

Aggrawal, (2001:52), reiterates that audiovisual aids, audiovisual materials, audiovisual media, and learning resources all mean the same thing. Earlier the term used was audiovisual aids in education. With the advancement in the means of communication and that of technology, educators invented new terms. More specifically, media refers to films, filmstrips, recordings, etc. The use of newer terms educational technology or Instructional technology is primarily due to the dynamic expansion of programmed learning, computer assisted instruction and educational T.V. This revolution in the field of audiovisual education is the outcome of the development in electronics, notably those involving the radio, tape recorder and computer (Aggrawal, 2001). Nevertheless, it is worth noticing that the term audiovisual aids is currently regarded as obsolete inasmuch as it is long associated with the idea of making the learning 'pill' more palatable.

Gass, (cited in Armsey, 1973, P. 1), defines educational technology as "the organized design and implementation of learning systems taking advantage of but not expecting miracles from modern communications methods, visual aids, classroom organization, and teaching methods." According to the British National Council on Educational Technology (NCET) (1971), Educational technology involves the application of systems, techniques, and aids to improve the process of human learning. NCET (cited in Armsey, 1973), further expanded this description as:

It is characterized by four features, in particular, the definition of objectives to be achieved by the learner; the application of principles of learning to the analysis and structuring of the subject- matter to be learned; the selection and use of the appropriate media for presenting material; and the use of appropriate methods of assessing student performance to evaluate the effectiveness of courses and materials. (P.2)

According to Armsey (1973:4), instructional technology can be defined in two ways:

In its more familiar sense it means the media born of the communications revolution which can be used for instructional purposes alongside the teacher, textbook, and blackboard. In general, the pieces that make instructional technology are: television, films, over head projectors, computers and the other items of "hard ware" and "soft- ware."

The second and less familiar definition of instructional technology according to Armsey (1973) goes beyond any particular medium or device. In this sense, instructional technology is more than the sum of its parts. It is a systematic way of designing, carrying out, and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communication and employing a combination of human and non human resources to bring about more effective and efficient instruction.

Heinich, et al. (1996) and Newby, et al (1996), (as cited in Abraham, 2001, P.8), described instructional materials as: "all sorts of physical means used to carry instructional contents, that means, knowledge, skills and attitudes from various sources to students and they aim at realizing a set of instructional objectives"

Burton, Good. Dale, Kinder, S. James, Mcown and Roberts; all cited in Aggrawal. 2001, P. 153), respectively provide the definition of Audio Visual Aids, and hence of instructional materials in the following manner:

- They are those sensory objects or images which initiate or stimulate and reinforce learning.
- They are those aids which help in completing the triangular process of learning i.e., motivation, classification and stimulation.
- They are those devices by the use of which communication of ideas between persons and groups in various teaching and training situations is helped. These are also termed as multi- sensory materials.
- They are any devices which can be used to make the learning experience more concrete, more realistic and more dynamic.
- They are supplementary devices by which the teacher, through the utilization of more than one sensory channels is able to clarify, establish and correlate concepts, interpretations and appreciation

(p.54).

All the aforementioned definitions about instructional materials underscore the important values of the proper use of instructional materials and consolidate the idea that instruction without the help of teaching materials is tantamount to meaningless and lifeless, so to speak. In the light of this notion, Aggrawal (2001:54) describes the use of instructional materials as an antidote to the disease of verbal instruction in that it reduces verbalism, helps in giving clear concepts and thus aids to bring about accuracy in learning.

2.2. Classification and Types of Instructional Materials

It is apparent that a wide range of media have been in use for the provision of useful instructional benefits. The impact that instructional materials have on instruction is quite phenomenal, because some barriers of communication can be overcome drawing upon instructional materials appealing to the senses of the learners.

Instructional media may vary from print media which are linear including, microfilms, micro cards, microfiche, text books, supplementary books, booklets, pamphlet, magazines, newspapers, duplicated materials, handouts, leaflets, newsletters, documents, clippings, flash cards to real objects that are three- dimensional involving, field trips, demonstrations, specimens, collections, models, mockups, experiments, exhibits, displays, dioramas, toys and the like. In accordance with this, various educators deemed it necessary to divide instructional materials into different categories for the sake of simplicity and convenience.

In light of this, Rao, Aman (1995:133), attempted to classify instructional materials as: Visual aids, Audio aids, Audio visual materials, Activity aids, and Memory aids.

According to Rao (1995) visual materials include:

- i. Display Boards such as chalk boards or Black boards, Flannel boards, bulletin boards, magnetic boards etc.
- ii. Charts, pictures, and models. Visual aids according to Rao (1995) are those which can be appreciated and understood by seeing them only.

Audio aids include:

- i. Broad cast talks
- ii. Gramophone lectures, and
- iii. Tape recordings.

Audio- visual materials encompass both optical aids and Television. In this category those teaching materials which involve the use of two of our senses i.e. hearing and seeing are included, by the same token, Aggrawal (2001:161), provides the classification of instructional materials in the following manner:

Classification Number 1: Projected and Non- Projected Materials.

Projected materials	Non- projected materials				
	Graphic Aids	Display Boards	3- Dimensional Materials	Audio Aids	Activity Aids
films	- Cartoons	- Black board	- Diagrams	- Radio	- Computer
Filmstrips	- Charts	- Bulletin	- Models	- Recordings	Assisted instruction
Opaque projectors	- Comics	- Flannel board	- Moekups	- Television	- Demonstrations
Overhead Projectors	- Diagrams	- Magnetic Boad	- Objects		-Dramatics experimentation
Slides	- Flash cards	- Peg board	- Puppets		- Field trips
	- Graphs		- Specimens		-Programmed-Instruction
	- Maps				-Teaching-Machines.
	- Photographs				
	- Pictures				
	- Posters				

Aggrawal (2001) further classifies Audiovisual materials as in the following.

Audio Materials	Visual Materials	Audio Visual Materials
Language laboratories	- Bulletin boards	- Demonstrations
Radio	- Chalk boards	- Films
Sound distribution system sets	- Charts	- Printed Materials with recorded sound
Tape and Disc Recordings	- Drawings	- Sound film strips
	- Exhibits	- Study trips
	- Film Strips	- Television
	- Flash Cards	- Video tapes
	- Flannel boards	
	- Flip charts	
	- Illustrated books	
	- Maghetic boards	
	- Maps	
	- Models	
	- Pictures	
	- Posters	
	- Photographs	
	- Silent films	
	- slides	

As regards media classification, Schram, (1977), also has his own way of considering the issue. According to him, media is categorized into Big Media and Little Media. By the Big Media, he means the complex, expensive media like television, sound films, and computer- Assisted instruction. By the Little Media, he means the simple ones which stretch all the way from slides, slide films, and projected transparencies to radio and programmed texts.

According to Mcluhan (1964:22), media is classified into Hot and Cold media. Mcluhan depicts the basic principle that distinguished a hot medium like radio from cool medium like the telephone, or a hot medium like movie from a cool one like TV as follows:

A hot medium according to Mcluhan (1964), is one that extends one single sense in "high definition". High definition is the state of being well filled with data. A photograph is, visually, "high definition". A cartoon is "low definition," simply because very little visual information is provided. Telephone is a cool medium, or one of low definition, because the ear is given a meager amount of information. Mcluhan further notes that speech is a cool medium of low definition, because so little is given and so much has to be filled in by the listener. On the other hand, hot media do not leave so much to be filled in or completed by the audience. Hot media are, therefore, low in participation, and cool media are high in participation or completion by the audience. That is to say, any hot medium allows of less participation than a cool one, as lecture makes for less participation than a seminar, and a book for less than a dialogue.

Amare (1999:53), also classifies instructional materials into concrete and abstract ones. According to him the concrete materials include: models, specimens, simulators and they are those that allow physical involvement of learners while the abstract ones are those which allow imaginative involvement or sensory involvement (learning with written or spoken words).

By and large, it seems that educators hold deep conviction that classification of instructional materials eliminates confusions stemming from a wide range of terminologies used for various instructional devices, and ensure more inclusiveness as well.

2.3. Importance and Need for Instructional Materials

In order to place learners in an active learning mode, the role of instructional materials is absolutely phenomenal. Teaching materials have a major and direct influence on actual teaching and on its educational outcomes. That is why, educators like Sivertsen (cited in Reinhartz, 1997, P. 307), reiterate that learning with materials and hands- on experiences makes instruction concrete and relevant for students, which in turn allows them to construct meaning by piecing together bits of information. Hence, instructional materials are those instructional devices which are used in the classroom to encourage learning and thereby making it easier and interesting.

These materials include charts, maps, models, concrete objects, filmstrips, projectors, radio, television etc. Obviously, these materials make for a good communication, healthy classroom interaction and effective realization of the teaching objectives. It is much easier for the learners to believe what they see than what they hear; if they both see and hear, then they can understand more readily and retain more lastingly. In this regard, Erickson, Carlton (1965), contends that audiovisual materials are used to make the meaning of words clear, and likewise words are used (verbal methods, using all printed media) to make pupil experiences based on audiovisual media presentations clear, meaningful and useful.

Erickson further notes that one of the salient features of instructional materials is that they make possible a broader range of sensory stimuli. Hence they provide a more direct form of experience to facilitate hearing, seeing,

doing, and trying. To substantiate this notion, Aggrawal (2001:157), states the following popular sayings on the need and importance of instructional materials as:

I hear, I forget,

I see, I remember

I do, I understand.

John Mander (in Aggrawal 2001), also enumerates five main reasons to underscore and justify the use of instructional materials for better teaching and learning in the following manner:

- a. To teach something more thoroughly so that the children may retain the subject matter taught.
- b. To teach something more quickly. This will result in covering more ground in a given time, and thus gives a better chance of “getting through the syllabus.”
- c. As a means of creating or sustaining interests.
- d. As a means of integrating a number of separate pieces or work already learned by other means.
- e. As a means of bringing with the experience and understanding of learners something which is new to them. This often includes the presentation to learners, in a simplified form, of matters which can be appreciated fully only by adults (p.95).

The Ethiopian Education and Training Policy (ETP) document (1994), underscores the role of instructional materials as follows: “In order to promote the quality, relevance and expansion of education, due attention will be given to the supply, distribution and utilization of educational materials, educational technology and facilities.” (p.27)

In order to emphasize the roles of educational technology, Reinhartz (1997:197), categorized technology into non interactive technology and Interactive technology. Non interactive technology according to him includes

tape recorders, sixteen millimeter film projectors, opaque projectors, filmstrip projectors, video cassette recorders (VCRs), and television. According to Reinhartz, information presented on non interactive technology can not be changed by the viewer, it can be turned on or off, and stopped at appropriate points, but the viewer cannot respond to the media interactively. That is to say, more often than not, the learner is an observer, not a participant.

As pointed out by Reinhartz (1997), non interactive technology is frequently used to do the following:

- Introduce a topic or skill
- Open a lesson and/or unit
- Motivate students
- Practice a concept or skill
- Stimulate discussion
- Provide background information
- Close a lesson with a review (p.197)

As regards interactive technology, Reinhartz (1997) says that using this type of technology allows the learner to manipulate the technology for specific learning goals/ purposes.

Interactive technology comprises computers, laser discs, compact disc players, modems, and video discs. Concerning interactive technology, Reinhartz asserts that this type of technology is often used by the teacher to discharge the following tasks:

- Answer questions
- Record information
- Add possible outcomes to a situation, experiment, or a story
- Solve problems
- Plan and implement a strategy.

- Design models (p.197)

Such engagement according to Reinhartz (1997) encourages the learners to function at a higher level of thinking (analysis, synthesis, and evaluation).

Dale (1969), cited in Amare (1999), lists the pedagogical uses of instructional materials as follows:

1. Facilitating active learning
2. Encouraging creative thinking.
3. Effecting student skill development
4. Overcoming the limitations of time and space
5. Concretizing abstract experiences.
6. Creating access to invisible realities
7. Teaching and entertaining
8. Relating theory with practice
9. Making learning more functional by increasing retention.
10. Assisting learning of a method of learning in the field.
11. Encouraging responsibility (p.55).

✓ Erickson (1972), argues that instructional materials may perform some superhuman tasks for the teacher thereby providing a comprehensive listing of the roles of instructional materials in the teaching- learning process as indicated below:

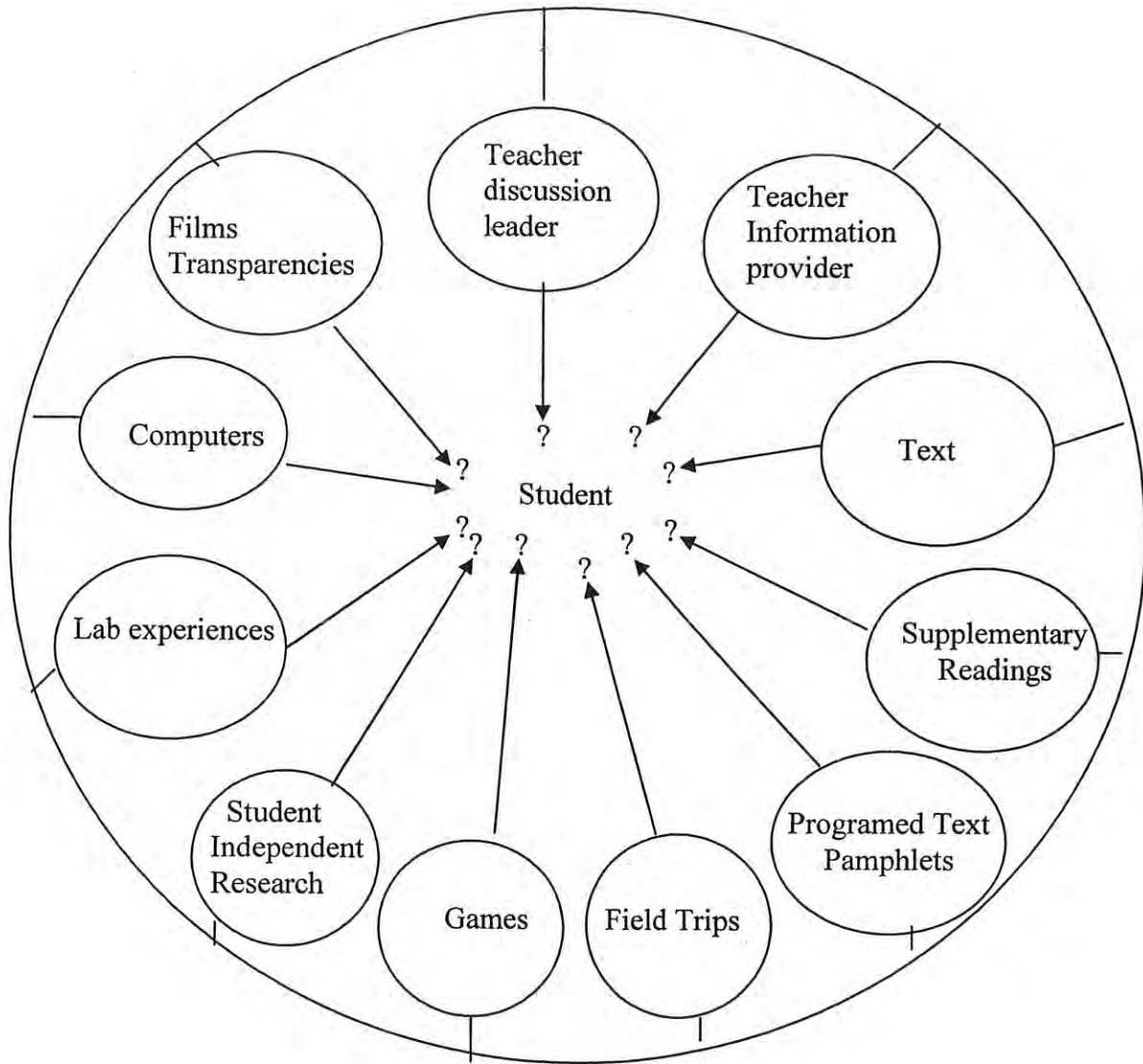
1. They provide the teacher with a means for extending his students' horizon of experience.
2. They help the teacher provide his students with meaningful sources of information.
3. They provide the teacher with interest- compelling springboards which can launch students into a wide variety of learning activities
4. They multiply teacher's efficiency by providing tutorial stimuli and response guidance for individual students and small groups.

5. They help the teacher overcome physical difficulties of presenting subject matter.
6. They offer rich opportunities for the students to develop communication skills while actively engaged in solving meaningful problems.
7. They provide the teacher with tools to carry out diagnostic testing research, and remedial work (p.18-33).

The teachers role in the selection of instructional materials is very important. In respect of this, Singh (2005) suggests that the effective teacher, as a selector of instructional strategies, has to:

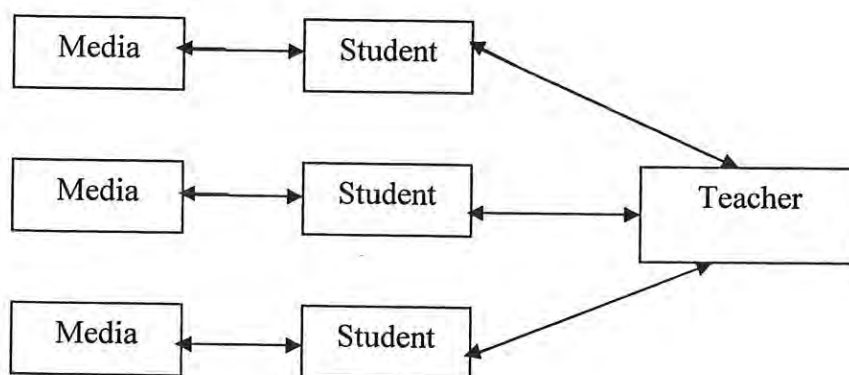
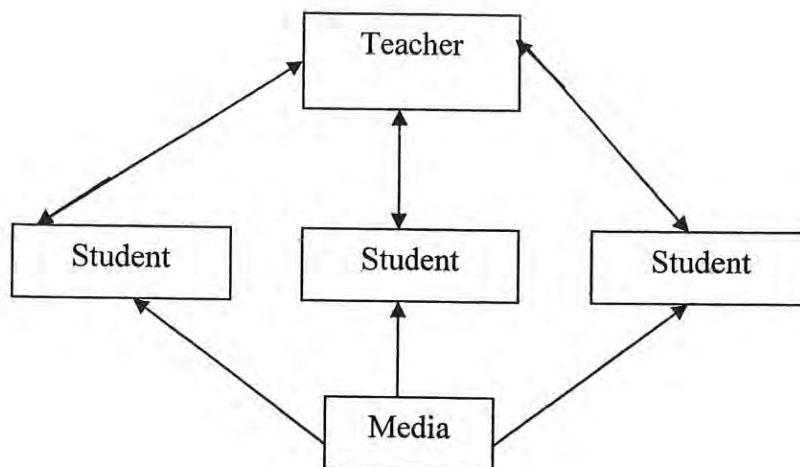
1. Plan to influence directly or indirectly the learning process by varying his behavior.
2. Tailor the subject matter to meet the needs and interests of each individual learner.
3. Arrange a variety of media, including books, lecture notes, homework, visual aids (materials), programs, discussions, and laboratory experiences (p.3).

According to Singh (2005) the model of effective teaching places the student in the center completely surrounded by multi sensory media arranged by the teacher who functions as a prescriber-organizer as shown in the diagram below.



The Teacher as a prescribes- organizer
An excerpt from Teaching of Science, 2005.

In support of this view, Erickson (1972:73), compares two simplified flow diagrams depicting a possible relationship between students, media, and a teacher, in which students do some of their learning/ interacting face-to-face with the teacher and some in direct interface with the media as indicated in the figure below.



(Relative Roles of Students, teachers, and Media)

An excerpt from Fundamentals of Teaching with Audiovisual Technology

Very few of the combination of media, subject matter, and learners have been tested in comparative studies. There is almost a complete lack of studies intended to ascertain under what conditions and for what purposes one medium may be superior to another. That is, no literature has, thus far, confirmed that there is one best medium to make for teaching. Indeed, research studies show that people learn from the media, but very little evidence confirms as to which medium, in a given situation, can bring about the most

learning. However, there are clues that one medium may be more effective than another for a given learning task or a given kind of learner.

Pedagogical evidences, too, confirm that no single medium is likely to have properties that make it best for all purposes. When effectiveness of one medium is compared with another for instruction in any given subject, it is rare for significant differences to be found. In this regard, Gagne, (cited in Schramm, 1977) concludes that "there is no one best medium, no super medium to make for teaching" (p.61). As a matter of fact, almost all teaching is multimedia, and it is evident that teachers as well as educators commonly believe that multimedia instruction is more effective than a single medium.

Eventually, it is worth concluding this section by mentioning the potential benefits of instructional materials enumerated by Armsey, (1973) as follows.

1. To make education more productive and more individual.
2. To give instruction a more scientific base.
3. To make instruction more powerful.
4. To make learning more immediate.
5. To make access to education more equal (p.8).

2.4. Principles for the Use of Instructional Materials

Uses of media involve a somewhat different set of considerations and procedures that a teacher/ monitor is expected to stick to. One standard for judging competence of teachers is the inventiveness of their class room use of media. Media utilization techniques must arise out of a matrix of principles and actual experience, and should involve original thought instead of merely being a list of recipes absorbed from text books or borrowed from colleagues.

Burton and Brueckner (cited in Erickson, 1972:163-170), stressed this point of view as:

Techniques are necessary and important-in fact, nothing could take place in any field without ways of doing things. Principles-that is, general truths or concepts or accepted tenets are also necessary. New techniques are constantly being devised, which are better ways of carrying out principles and which, furthermore, must be chosen discriminatively to fit given circumstances. Principles are guides that help in selecting techniques.

So, in light of this notion, Burton and Brueckner further enumerate five utilization principles that may form a matrix of learning's and thus serve teachers well in making day-to-day decisions as regards their uses of media as follows:

1. Principle of Selection

With regard to this, teachers should base their selection of media on valid learning objectives and the unique characteristics of learners. This principle pertains to the ability to find and choose appropriate media, from textbook to field trips, and from models and mockups to video tape recordings. According to Burton and Brueckner, this basic ability demands subsidiary abilities to:

- Identify and write out appropriate teaching purposes and specific performance criteria and conditions in clear and consistent form.
- Locate suitable media from resource files, catalogs, and resource books.
- Select specific media to make optimum contributions to the objectives that were formulated.
- Predict that an identified learning experience will influence students in desirable and specific ways.
- Relate precisely various kinds of selected media to specific problems, as they are being worked on by individuals and groups.

- Select media for use in new and more efficient ways to involve students in self- instruction process and/or large group or team- teaching methods.
- Select appropriate media to play a variety of instructional roles.
- Judge the quality and suitability of specific media on the basis of the interests, experiences, maturity, and powers of comprehension of specific group of learners (p.163).

2. Principle of Readiness

The use of media should be preceded by the development of adequate learner readiness for effective participation. This principle is concerned with the ability to build student readiness. In this case, too, Burton and Brueckner say that this basic ability calls for subsidiary abilities such as:

- Developing a specific readiness plan of what to do and say.
- Guiding learners in determining individual or group needs for the media selected.
- Relating specific media to specific problem- solving activities
- Employing a variety of methods for building readiness, including the procedure of setting up a class problem before the materials are presented, and including readiness plans in written form.
- Use a number of sources of information in making readiness decisions, such as specific performance criteria and knowledge of learner characteristics (p.165).

3. Principle of Control

Physical facilities and conditions for using media should be arranged for by the teacher in a manner that provides for the economy of time and optimum learner attention and participation. Here, related subsidiary abilities to the important one as described by the same authors are:

- To operate available kinds of audiovisual equipment.

- To detect improper use or malfunctioning of equipment
- To judge the degree of darkness needed for proper viewing of projected images under various learning conditions.
- To arrange proper placement of screen, seats, speakers, and other apparatus for proper learner attention and participation.
- To make efficient arrangements for viewing and responding to media presentations and for manipulating or handling models, charts, maps, demonstration materials, and related devices.
- To plan proper timing for using or presenting audiovisual media within existing school schedules (p.167).

4. Principle of Action

Teachers should guide learners in their response to experiences with media.

The basic ability to guide student responses, as the authors point out here, demands the following subsidiary abilities to:

- Identify and call for learner activity in direct relationship. To teaching purposes and objectives.
- Formulate and use valid, provocative and illuminating thought- type questions.
- Employ good discussion techniques based on known and accepted problems, topics, and issues.
- Organize student action around imaginative, challenging and unique problem- solving experiences and projects.
- Prepare work sheets and arrange media sequences calling for specific responses in the light of (a) objectives; (b) a given audiovisual presentation or reading assignment; and (c) a particular instructional environment.

- Organize and manage individualization and/or large group situations in which media are programmed to carry out specific aspects of the instructional process.
- Organize action of students around the production of instructional materials as significant group and individual learning activities (p. 168).

5. Principle of Evaluation

In the final analysis, Burton and Brueckner suggest that teachers should subject both media and their own utilization techniques to continual evaluation.

Further more, these authors present the subsidiary abilities of the basic ability as:

- To engage in the process of self criticism with willingness to modify previous plans of action.
- To judge the worth of all media in terms of specific learning objectives, without losing sight of human values.
- Scrutinize the procedures used in light of student growth.
- Make use of various sources of data in making judgments of strengths or weaknesses in media and methods (p. 170).

Concerning the principles of utilization of media, Brown, W. (1977), also suggests the following guide lines:

- Prepare in advance.
- Arrange the environment
- Prepare the group with whom the item will be used.
- Use the item as appropriate.
- Follow upon the Experience by returning to any “points to look for” or questions raised during the introduction of the item.

- Locate and make available materials suited to the ability levels, study purpose; and learning styles of particular learners.
- Arrange interesting and functionally organized displays of such materials from which learners are encouraged to make their own selections, as appropriate.
- Develop a plan for circulating materials along with appropriate directions for use (and assignments for study), and for maintaining necessary inventory controls for them.
- Develop (or use already- prepared) independent study assignments that call for the completion of well- explained tasks and the preparation of specific products related to the study efforts.
- Develop evaluation procedures and instruments through which individual students may to some extent possible, assess results of their own independent studies and obtain guidance for need repeats or correcting in the study.

According to Aggrawal, (2001:158-159) principles in the use of instructional materials are arranged in the following way:

- Principle of selection
- Principle of preparation
- Preparation of physical control
- Principle of proper presentation.
- Principle of response
- Principle of Evaluation.

Towards the end of this section, it is worth noting that most worthwhile and permanent learning takes place when students and teachers agree on objectives and performance criteria, therefore selection of media should be based first on the needs and desired achievements of specific learners. That is, both teachers and students need to evaluate media in terms of their potential

value in stimulating inquiry or meeting specific objectives. Actually, it is evident that locating, evaluating, selecting, and obtaining appropriate media resources is predominantly the most important part of every teacher's job.

2.5. Physics Instruction and Instructional Materials

Physics is an empirical study or a science of measurement. Hence, it is unquestionable that the effective teaching and real understanding of physics will become a reality only through the proper use of instructional materials and learning experiences. In order to emphasize the empiricism of physics and the laudable impact instructional materials have on physics instruction, Kelvin (cited in Sears, 1980:1) eloquently states the following:

I often say that when you can measure what you are speaking about, and express it in numbers, you know something about it; but when you can not express it in numbers, your knowledge is of a meager and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely, in your thoughts, advanced to the stage of science, whatever the matter may be.

In light of this point of view, Tyler, (1949:63) says that learning takes place through the experiences which the learner has; that is, through the reactions he/she makes to the environment in which he/she is placed. To him, learning takes place through the active behavior of the student; it is what he/she does that he/ she learns, not what the teacher does.

In a similar fashion, Singh (2005:2-3) argues that the physics teacher must design or select each strategy he/she employs in his/her instruction, and each design or selection should be based on his/her interpretation of what he/she thinks will constitute effective instruction for his/her particular students. Singh (2005) further contends that the interpretation of the physics teacher should be based on empirical evidence, past experience, and extensive knowledge of methods and materials.

In order to make for effective and efficient physics instruction, it is mandatory for the physics teacher to arrange a variety of media, including books, lecture notes, homework, visual materials, programs, discussions, and laboratory experiences. Learning experiences and the media utilized determine the effectiveness of a given learning situation, and hence physics instruction is no exception.

For instructional materials to take hold, the role of the teacher takes on significance. For physics teachers to be successful in implementing in the classroom, they need a stronger knowledge base, more practice and involvement with the equipment. With regard to this, Reinhartz (1997) suggests that teachers might find it helpful to ask themselves the following questions as they make decisions about using instructional technology in their classrooms:

- Is the technology appropriate for the developmental level of the students?
- Are the goals of the lesson being met? If not, why? If so, in what way?
- Does the instructional technology involve several senses and skills (such as watching, listening, and thinking)?
- Does the instructional technology provide opportunities for pausing and making comments or elaborating?
- Can the technology be managed in a way that presents several different forms of learning? (p/202)

Rao (1995) enumerates the phenomenal impact teaching materials have on physics instruction as follows:

1. They help the teacher in getting the attention of his students
2. They help in creating the interest of the student in the topic and activate the mental process of the student
3. The student gets opportunity to have first hand experience by visualizing some concrete things, living specimens and actual demonstrations etc.

4. Use of instructional materials help the learners have clear conception of ideas, information, facts and principles.
5. They help the students in understanding some complicated and difficult concepts.
6. They provide an opportunity for a change in the monotonous atmosphere that generally prevails in the classroom.
7. They provide an opportunity for a better support between the teacher and his students.
8. They help the students develop a scientific attitude.
9. They provide a training in scientific method (p.131).

This actually implies that instructional materials are essential ingredients in any instructional process in that they aid teachers in delivering effective instruction. It is beyond doubt that IMS have got terrific impact on the teaching learning process. Hence in order to accomplish effective physics instruction use of a variety of instructional media is of a paramount importance.

2.6. The Physics Laboratory

Physics is essentially a practical oriented subject and laboratory work forms an important part of physics education. For carrying out demonstration experiments and for the performance of practicals by the students, the physics laboratory is a must for every school offering physics as a subject. With regard to this, Rao (1995:113) asserts that a physics laboratory is justified on the following grounds:

- In a physics laboratory the required apparatus and other equipment etc. can be safely stored.
- As in other science subjects so also in the case of physics, laboratories are helpful in creating and promoting scientific attitudes in the students'
- Laboratory provides a proper and ideal place for performing experiments and is helpful in developing a sense of cooperation among the students.

In order to achieve success in physics instruction at secondary school level, the physics laboratory need to include the following:

- There should be supplies and apparatus for a broad range of experimentation. This laboratory should inspire teachers to encourage and direct creative extra- class activity among their students.
- There should be provision for the construction, repair, and adjustment of apparatus. Such work requires work space, materials and tools.
- There should be demonstration and laboratory equipment and supplies and for on-going projects
- There should be adequate gas, electrical, and water services.
- There should be enough storage space for equipment and supplies as well as for on-going projects.
- There should be audiovisual resources such as projectors and recorders, charts, models, slides, recordings, and materials for making charts, and slides.
- There should be library resources such as reference materials textbooks, laboratory manuals, bulletins and books to encourage free reading of both teachers and students.
- There should be a good demonstration desk equipped with gas, water, and electrical services.
- The facilities should be such that the arrangement of the room is flexible (Singh 2005, PP. 111-112).

For physics instruction, laboratory together with realistic pieces of equipment, should be given due attention because it is capable of providing opportunities for varied and rich experiences for the learners. In line with this Mekbib (1999:8) contends that:

There is little doubt that a particularly clever lecture, demonstration, or passage in textbook is capable of arousing a certain amount of interest and need to know. But a more effective way of arousing student interest is to conduct a laboratory experiment or discussion that involves students more actively than does listening to a lecture or reading a book.

2.7. Availability and Production/ Improvisation of Instructional Materials

Teachers every where need to have at their fingertips the vast reservoir of teaching materials to provide better instruction, and enhance clarity of communication as well as speed of comprehension. Even if teachers may not have the necessary instructional materials at their fingertips, they should strive to produce or improvise their own from locally available materials in collaboration with their students for the sake of quality teaching and learning.

In connection with this idea, Brown and Lewis (cited in Brown, J. W. 1977), stressed the significance of the process of creating instructional materials in the following manner.

Creating instructional materials is a complex process with high learning potential, for both teachers and students. The first step is to isolate facts, procedures, or concepts that learners find it difficult to master; then either the teacher or students together or alone, create communication resources to solve these problems. The very process of devising solutions to learning problems helps to clarify and implement communication.

This means that if instructional materials are available and utilized to various learning situations, they are capable of providing the learners with opportunities and active support for comprehension and application of basic skills to the acquisition of increased understanding.

2.7.1. Selecting Learning Materials

Here an attempt is made to raise key questions with respect to the selection of instructional materials.

- What learning resources (materials) will be required to arrange and conduct the planned learning experience?
- On what basis should they be selected?
- How should they be used?

Schramm (1997) (cited in Brown, J.W.1977: 27-28) makes several points about media selection: "Almost any medium can perform almost any instructional or informational function..." Every medium has its own ways to attract and hold attention, or to remind a student what he/she has previously learned, or to furnish examples, or explain concepts.

This is not to say that one medium can't do a given task better than another. For example, films or television are better than still pictures or radio to show how an internal combustion engine works; radio or tapes are better than certain other media for oral language practice.

Schramm further said that: "It seemed to matter less than we had thought which media were used... Big or Little, broadcast or visual or print. What did seem to matter was how they were used, and especially how they were built into an organization for learning and action."

According to Brown, J.W. (1977), media selection should be in consonant with the following criteria.

- Pertinent to the subject studied and to the goals of that study, as well as suitably "fitted" to the nature of the content itself.
- Of such a nature that learners who use any item are able to actually experience what it is intended that they experience, without encountering barriers of speech (unfamiliar dialect, pronunciation), or meanings (unfamiliar words, expressions),

- Capable of being experienced (projected or heard, for example, which assumes power, darkness, viewing spaces) in the environment in which they will be used.
- Appropriate for use in the instruction/ learning mode selected, such as television or radio programs for simultaneously- broadcast, super large group coverage, sound film strips for small groups, or print or audio cassette items for individual study.
- As simple as possible to obtain and use which means, in many cases, without the necessity of an accompanying and often very expensive (and perhaps complicated or even unavailable) piece of equipment being necessary in order to experience the media at all.
- Capable of eliciting active participation rather than an inert, passive response to the learning experience (causing the learner to do something... rather than sitting and listening or watching).
- Sufficiently narrow in treatment and content to provide an emphasis in areas of learning where media contributions are especially needed and appropriate.
- Both affordable and cost- effective, but not necessarily the least expensive of all media that could be provided for the purpose.
- Compatible with and supportive of any already- institutionalized, and functional, information access and dissemination systems administered within the country or area of the country involved (p.64).

The fact that there is no one best medium for all purposes is also stressed by Schram (1977) as in the following:

Perhaps the central conclusion about media effectiveness... is the extremely broad band relation of media to learning tasks. Students learn from any medium in school or out, whether intended or not... providing the content of the medium leads them to pay attention to it... Furthermore, we find the media able to carry out a wide variety

of instructional tasks. Therefore choosing media usually means choosing a combination of media. Most teaching is multimedia, and has been so since the Stone Age man used bow and axe as media of demonstration and practice (p. 267-268).

There is no question that both content and learning experiences should be within the grasp of the learners, moreover, content and learning experiences of which instructional materials are a part are very closely intertwined. Hence to present content to the students, selection of appropriate learning resources will be paramount in such a way that the desired learning will take place.

2.7.2. Production (Improvisation) of Instructional Materials

Ethiopia is a poor country with limited financial resources. Due to this financial constraint the country cannot afford to purchase all the necessary teaching materials. Hence teachers are required to produce inexpensive instructional materials from locally available materials in collaboration with their students in order to impart effective and efficient education. Therefore, a teacher with some ingenuity and manual skill can make a number of valuable and serviceable articles from discarded things all around him. For this purpose every school pedagogical center and laboratory should be equipped with a work bench and a kit of tools that may be used by students and teachers in making and improvising instructional materials.

Brown, (1977) suggests that production activities both by students and teachers might encompass three stages, namely, mechanical preparation level... doing production job as requested, creating level... involving more judgment regarding the selection and presentation of materials to achieve specific learning goals, and eventually design level which involve the integrated planning and production of a number of integrated media items designed to fit effectively into predetermined teaching- learning process.

Production of Local Instructional Materials

There may be times when you prefer to produce materials for your own classroom as well as times when such production activities will be especially beneficial as learning experiences for your students.

Thus instructional materials may be produced by teachers and students as well.

a. Teacher Produced Materials

As a teacher, you will probably consider producing instructional materials in one or both of two general categories. First, materials to be used in your own presentations and in leading class discussions or for testing or carrying out other teacher- directed activities. Second, those materials you wish to put directly into the hands of your students for their study and use.

Though basic and quite general resources may be available, locally oriented or specialized resources on the subject may be missing. In such cases, producing them yourself or with the help of students may be the best, perhaps the only, way to get them.

Current wide-spread recognition of the need for locally produced materials will, obviously, encourage the development of media production centers in individual schools. Such production centers in schools may offer a number of professional and technical services which the teacher will find useful.

A side benefit to be realized in planning and producing your own materials, or in assisting your students to prepare them is that in doing these things you will always clarify your own objectives and ideas about the subject and your approach to teaching.

b. Student Produced Instructional Materials

Students involved with their teachers in the production of instructional materials may obtain many benefits from their experiences. Consonant with this view, Brown, J.W. (1977) argues that students may discover, for example, that there are standards of quality that must be met, and that following specifications and meeting deadlines are important. They may also encounter new ideas and develop previously unrecognized creative talents which they can enjoy as hobbies, or perhaps as vocation, for the rest of their lives.

Talents of students for making or providing displays, independent study resources, tapes, transparencies, slides, single- concept motion pictures, or other media resources should not be underestimated. Physics students may produce, for example, such items as:

- Aneroid Barometer
- Spring balance
- Model of water pump
- Telescope
- Electric bell
- Periscope
- Pinhole camera and the like.

Advantages of Improvised Instructional Materials

Nowadays a large quantity of material and equipment are needed for demonstration and experimentation in the physics laboratory. A physics teacher with strong determination and necessary skill can go a head with the task of improvising apparatus and equipment by making his students to work under his guidance. Homemade or improvised apparatus is the apparatus and equipment made from very lowcost raw materials, with the help of students under the teacher's guidance.

Rao (1995:161) enumerates the advantages this type of apparatus has as follows:

- i. Economical- They are quite economical as they are made by the students with the help of very low cost waste materials.
- ii. Psychological value- psychologically they are beneficial to the students because:
 - a. They satisfy the basic instincts and urges of the learner (e.g. curiosity, constructiveness, inventiveness etc).
 - b. They provide enough opportunities for self- expression, self-development etc.
 - c. They provide healthy channel for the pent up emotions and creative energy of the students
- iii. Educational value- They also have an educational value because of the following:
 - a. They use the principle of 'learning by doing'.
 - b. They provide opportunity to the child to put his theoretical knowledge in practical use
 - c. They are simple and convenient
- iv. Social value- In making improvised teaching materials students learn the habit of working with their own hands which help them to realize the dignity of labour and thus the student develops a healthy and positive attitude towards manual work.
- v. Entertainment value- while producing instructional materials the learner derives a great joy and happiness. It can also be taken as a hobby which provides a lot of refreshing and recreational value and a good utilization of leisure time.
- vi. Inculcation of scientific attitudes and values- the students in devising the improvised materials develop the following attitudes:

So, as students invest their time and effort, be sure that they continue to improve and that they feel rewarded and stimulated by their progress.

2.8 Utilization of Instructional Materials to Enhance the Quality of Teaching and Learning in Physics

Instructional materials are required by a physics teacher, like teachers of other subjects, for the effective teaching of the subject and to realize various objectives of teaching physics. Furthermore, instructional materials help the teacher to communicate with his students in a more desirable and effective way. This, however, will be materialized only to the extent that the teacher is competent to use the teaching materials effectively and to discriminate wisely in his choice of science activity in a given situation.

Apparently, physics is one of the natural science subjects offered in our school system since secondary education was founded in our country. Birhanu (1999:44). Contends that physics instruction at both global and national levels has undergone many changes. The global curricular innovations such as the PSSC in the USA (in the 1950s and 1960s) and the Nuffield physics in the UK (in 1960s and 1970s) and the integration of technology education in to the school curricula and the science, Technology and Society (STS) approach (in the 1970s and early 1980s) have influenced the physics instruction in our schools. Birhanu (1999) furthers discusses that physics in our school system has made changes in its objectives, contents, and methodology. For example, from learning to be a scientist to solve every day problems, from concept learning to process learning and from closed ended to open ended investigation.

The 1994 Education and Training Policy (ETP) document also places an emphasis on learning physics, and science in general, through the problem-solving approach, integration of the real life experiences of our people to the school sciences and the employment of the STS approach.

According to Brown, (1977), two matters pertaining to the utilization of instructional materials deserve consideration here:

Firstly, the purpose for media utilization involving:

- Introduction of a subject to be studied, providing in effect an overview of the subject or, sometimes, a set of “jarring facts” with which to stimulate learner interest.
- Presentation of information, to establish or affect a particular attitude or value, or to develop or improve some skill.
- Aiding in organizing, presenting and summarizing, presenting and summarizing what has been learned, and
- Helping in evaluating what has been learned and how well one is able to use it in real live situations.

The second important matter deserving consideration, according to Brown (1977), is a basic approach to media utilization.

2.8.1. Utilization of Print Media

Print media are generally linear, meant to be read one unit at a time, and at least in a somewhat prescribed order. They are highly organized and meant to be coherent composed of a series of discrete pieces each with clear relations to the others.

Schramm (1977) says that the first instructional medium of modern times was print. Print shared the ideas of great thinkers and the strategies of teachers. Without it, no country would have dared contemplate the possibilities either of trying to achieve literate population or universal public education. Textbooks are designed to allow random but organized access to the information they

contain, print materials are useful both as primary and as supplementary teaching materials.

2.8.2. Utilization of Symbolic, Graphic Types of Media

This group consists of media for visual displays. All of the various media included here are quite in expensive, portable, and easy to prepare.

All are intended to gain or focus student attention and to stimulate interest through using color, design, and visuals (Brown, 1977:118).

2.8.3. Utilization of Three- Dimensional, Real Object

Media in the three dimensional, real category are all real things; they may be either unmodified, modified, or three-dimensional representations. Real objects can be removed from the environment and put into an organized study area.

This category involves:

- Field trips
- Demonstrations
- Specimens, collections
- Models, mock ups
- Experiments
- Exhibits, displays
- Toys.

The primary value of using real things in formal or non formal education is to enable students to see objects as a part of their environment.

Using real objects helps to break down boundaries between the artificial classroom setting and the real world.

Models and mockups are efficient means of representing real objects because they are modified to eliminate unnecessary details. Most real things are self-

explanatory. Most models can be assembled by students, thus enabling them to see their inner parts.

If designed, constructed, or collected by the students themselves, these media represent considerable background research and they can stimulate further interest in the subject (Brown, 1977, P.135).

2.9. Major Stumbling-blocks Facing the use of Instructional Materials

Although instructional materials serve quite useful purposes in the provision of quality education in any realm of study, there are several factors that can hinder the instructional functions of instructional materials. For instance, lack of financial resources, attitude and commitment of teachers, lack of interest on the part of the students, training status of teachers and media personnel, lack of laboratory facilities etc., are a few among the many factors to cite.

Teachers in a classroom tend to resist instructional materials, particularly and primarily television for several reasons.

According to Armsey (1973:10-12) some of the reasons may be enumerated as follows:

- The basic conservatism of the educational establishment.
- Fear of the effects of instructional technology on their (teachers) roles and responsibilities.
- The ineptitude and sensitivity of the hard ware people, and
- The minimal or non- existent involvement of teachers at every stage of process.

In discussing the conservatism of educational establishment, Beeby (cited in Armsey, 1973) identified five conditions which inhibit teacher acceptance of innovations:

- Ambiguity of the goals of education, making teachers hesitant to experiment.
- Misunderstanding or misinterpretation of new reforms.
- Identification with the traditional system
- Isolation from other teachers.
- A wide range in teacher effectiveness and adaptability.

Armsey (1973) further argues that a second major reason for teacher resistance lies in their apprehension by the things of learning.

Teachers are hesitant, Armsey says, to acquire new responsibility which they may not be professionally equipped to handle; they fear that technology may be teacher replacers instead of “teacher extenders.”

They worry that they may lose what they regard as “the essence of professional being.” The teacher fears competition with an inhuman, unbeatable adversary.

With instructional technology, they envision invasion of their authority in the class- room, and the concomitant loss of autonomy and professional privacy, separation from the student; and subsequently downgraded position, loss of recognition and prestige, and reduced rewards.

Psychologically and materially, teachers want from life and work much the same as everyone else. They see their traditional patterns of work threatened and their future made uncertain by the introduction of instructional technology. Teachers know or sense that the teaching role will be replaced by instructional technology. They are more and more required to become diagnosticians, program developers and managers of instructional activities. But it does not necessarily follow that as the teacher is provided “grateful release” from traditional functions, he will enthusiastically accept the new role, and further, some teachers are not qualified to fill the new role, and this aggravates the fear, hostility, and resistance (Armsey, 1973, P. 11).

Schramm (1977) comments on television as regards its shortcomings in instruction as:

The first of its two chief disadvantages is that "it is essentially a one-way medium...

It is not a good device for classroom discussion or for giving quick answers to questions from students". A second disadvantage is the difficulty of building television into the on-going activities of classroom fitting the same material to the needs of different classes at the same time, and creating an efficient team-teaching situation where the teachers may be miles apart. And because this is difficult and sometimes threatening and aggravating to the classroom teachers.

✓ Aggrawal, J.C. (2001:159-160) provides a list of obstacles the use of instructional materials encounter as:

1. Apathy of teachers- Teachers in general are yet to be convinced that teaching with words alone is very tedious, wasteful and ineffective.
2. Indifference of students. The judicious use of instructional materials arouses interest but when used without a definite purpose they lose their significance and importance.
3. Ineffectiveness of the instructional materials. Due to the absence of proper planning and the lethargy of the teacher and without proper preparation, correct presentation, appropriate application and discussion and the essential follow-up work, the instructional materials do not prove their full usefulness.
4. Financial hurdles. Lack of financial resources is also a major hindrance to the use of teaching materials.
5. Absence of electricity. Most of the projectors, Radio and TV cannot work without electricity.
6. Lack of Facilities for Training. Training agencies or institutions should make special provision to train teachers and workers in the use of these materials.

7. Lack of Coordination
8. Language difficulty
9. Not catering to local needs. Little attention is paid in the production of the local sociological, psychological and pedagogical factors.

Armsey (1973) also notes that teachers resist instructional materials due to the ineptitude and insensitivity of the producers, suppliers, and promoters of the things of learning, "many attempts at the application of instructional technology to education have been parochial and unimaginative transfers of devices from the industrial or entertainment world to the classroom. Applications are often carried out with little concern for the psychology of the classroom teachers, often with uncertain and sometimes clearly detrimental results."

Armsey further discusses that short-sighted educators are even more blame worthy:

Education although essentially a form of communication, has been the undertaking least affected in its mode of operation by recent developments. It is not surprising, therefore, that to the majority concerned with education, educational technology implies little more than gimmickry- a fringe activity peripheral to the real task of education. One reason for this attitude may be found in the promotional methods of some producers who oversell their equipment. The main factor, however, is the failure on the part of educators to appreciate that new means of communication require a radical review of the teaching- learning process.

In the final analysis, despite the aforementioned obstacles the use of instructional materials encounter, it is incumbent upon the teacher to persevere with these obstacles and create conducive learning environment in order to transmit quality education to the young learners of the society.

CHAPTER THREE

3. Research Design and methodology

3.1. Research Design

The nature of the data generated to undertake this study lends itself to both qualitative and quantitative approaches particularly to a descriptive survey. The researcher employed descriptive survey as his method of study because it provided the researcher with detailed descriptions of the existing conditions about the problem under investigation.

3.2. Research Context or Setting

As regards the research context, the researcher has chosen West Shoa Zone to conduct his study and thus six preparatory schools were included in the study as indicated in Table 1 beneath.

Since, the researcher, at one time, had been a resident of the area, he personally has some insight into the problems that the provision of quality physics instruction at the schools in the zone in question encounters due to inadequate facilities and shortage of instructional materials.

So, as a researcher, he planned to see any change in the status quo with a view to bringing the issue into focus. Evidently, concerns such as these prompted him to undertake this study. Another crucial point that has initiated him into carrying out the study is the commencement of preparatory school programs in recent years, which actually necessitated the study itself in order to know the prevailing situations with regard to physics instruction in the selected sample schools of West Shoa zone.

Table 1: Research settings and the participants of the study

S.No	Sample Schools	Respondents			
		Phys Teachers (N=30)	School Directors (N=12)	SPC coordinators (N=6)	Preparatory Students (N=30)
1	Holeta sec. school	5(16.7%)	2 (16.7%)	1	5(16.7%)
2	Addis Alem Sec. School	5(16.7%)	2 (16.7%)	1	5(16.7%)
3	Ginchi Sec. School	5(16.7%)	2 (16.7%)	1	5(16.7%)
4	Ambo Sec. School	5(16.7%)	2 (16.7%)	1	5(16.7%)
5	Guder Sec. School	5(16.7%)	2 (16.7%)	1	5(16.7%)
6	Buray Sec. School	5(16.7%)	2 (16.7%)	1	5(16.7%)

3.3. Population and Sampling Strategy

The research population included a range of respondents, namely, physics teachers, school directors, SPC coordinators and science preparatory students.

In order to select samples from the target population, the researcher adopted convenience/ volunteer and purposive sampling strategies. Volunteer sampling method was employed in order to select student respondents who participated in the interview.

Altogether, there are ten second cycle secondary schools or preparatory schools in West Shoa zone. Among these schools, six of them namely, Guder, Ambo, Ginchi, Addis Alem, Holeta and Burayu Secondary Schools were included employing purposive sampling strategy. Seeing that physics teachers, school directors, and school pedagogical center coordinators were few in member, all of them were included in the study employing availability sampling.

In its totality, 78 respondents or subjects were selected from all the sample schools in West Shoa zone. That is, 30 physics teachers (five from each school), 12 directors (two from each school), six SPC coordinators (one from each school) and 30 science preparatory students were included.

3.4. Data Gathering Instruments

There is a deep conviction that there is merit in using more than one instrument as they supplement each other to generate credible data. Accordingly, the researcher employed questionnaires, interviews and observation checklist as tools of requisite information procurement.

3.4.1. Questionnaire

Questionnaires with closed- ended and open-ended items were developed for three types of respondents: physics teachers, school directors, and SPC coordinators.

Questionnaires for physics teachers consisted of items regarding the availability of IMS, the adequacy of IMS, use of IMS, status of physics lab, availability of kits, basic demographic information, production of IMS, training opportunity for teachers, current status of SPC, support and encouragement provided by school administration, teachers' attitude towards IMS, etc. School directors' questionnaires included items concerning basic demographic information, ratings of instructional benefits of IMS, support and advice on utilization of IMS, teachers inclination towards production and use of IMS, contribution of SPC in enhancing physics instruction, financial and material support to SPC, attitudes of school directors towards IMS, etc.

Questionnaires for SPC coordinators inquired information about basic background information, services SPCs provide, training they received to provide requisite services, financial and material support for SPC, budget allocated by the school for the production of IMS, availability of guide materials

designed to assist users of SPC to prepare and use IMS, use of SPC by physics teachers to prepare IMS, types of IMS produced by teachers or students, attitudes of SPC coordinators towards the advantage derived from IMS, etc.

3.4.2. Interview

To supplement information procured through questionnaires, the researcher adopted a semi-structured interview. Semi structured interview were held with science preparatory students. Interviews were concerned with use of IMS by physics teachers, preparation of IMS by physics teachers together with the students, benefits of IMS, availability and functionality of SPC, etc.

3.4.3. Observation Checklist

In order to record information gained through observation, a checklist was employed to facilitate and systematize the observation recordings from laboratories and school pedagogical centers.

3.4.4. Validation of Instruments

To ensure the validity of questionnaires prepared in English, the researcher submitted the questions to two experts, one having a qualification of MA in English and the other having a qualification of MA in educational psychology for their comments or criticism. Based on the feedback obtained from these experts some modifications and improvements were made.

In addition to this, three data gathering tools, namely, questionnaire, interview and observation were triangulated for the purpose of enhancing the validity and verification of data generated.

3.5. Methods of Data Analysis

As far as data analysis is concerned, both qualitative and quantitative approaches were employed. Qualitative method was used to provide detailed descriptions of the data to help the researcher explore and discover inherent facts, while quantitative approach was meant for quantifying data generated in terms of frequencies and percentages.

CHAPTER FOUR

4. Analysis, Interpretation and Discussion of Data

The primary focus of this chapter is to organize and classify raw data gathered through such instruments as questionnaire, interviews and observations into specific patterns or categories; and then an attempt will be made to turn the data into useful and meaningful facts or information, thereby providing answers to the basic research questions of the researcher.

Table 2: Basic Demographic Information about the Respondents

Variable	Category	Respondents					
		Teachers N=30		Directors N=12		SPC coord. N=5	
		N	%	N	%	N	%
Sex	a. Male	29	96.7	12	100	5	100
	b. Female	1	3.3	-	-	-	-
	Total	30	100	12	100	5	100
Qualification:	a. 12+1	-	-	-	-	2	40
	b. Diploma	7	23.3	-	-	2	40
	c. BA/B.Sc	23	76.7	12	100	1	20
	Total	30	100	12	100	5	100
Years of Experience:	a. 1-10	16	53.3	3	25	1	20
	b. 11-20	6	20	3	25	1	20
	c. 21-30	8	26.7	6	50	3	60
	Total	30	100	12	100	5	100

Table 2 represents basic demographic information about the respondents of the study in terms of their sex, educational background and experience.

As regards sex, out of 30 (100%) teachers, nearly all of them, 29(96.7%) of the teachers, are male respondents. Only 1(3.3%) of the teachers is a female respondent. Both the school directors, 12(100%) of them, and the SPC coordinators, 5(100%) of them, are outright male respondents. With regard to educational background of the respondents, out of 30 (100%) of the teachers,

7(23.3%) and 23(76.7%) of them are respectively college diploma and first degree holders. As is evident from Table 2, all the school directors possess a first degree qualification. As to the qualifications of SPC coordinators, 2(40%) of them possess college diploma, 1(20%) of them is a degree holder while the remaining 2(40%) of them are with a qualification of 12+1.

When it comes to the experiences of the respondents, 16(53.3%) of the teachers, 3(25%) of the school directors, and 1(20%) of the SPC coordinators range between 1 and 10 years. Respondents whose years of experience range from 11 to 20 years are: 6(20%) of teachers, 3(25%) of school directors and 1(20%) of SPC coordinators. The remaining 8(26.7%) of teachers, 6(50%) of school directors and 3(60%) of the SPC coordinators range between 21 and 30 years with respect to their experiences.

The data from Table 2, reveal two prominent facts. On the one hand, the issue of a long-standing gender inequality which signifies the least participation of women teachers in the teaching profession in general and in teaching physics in particular, within the zone has become evident. On the other hand, the inequitable predominance or superiority of male teachers in the same profession has been disclosed. Apparently, the current trend not only engenders a feeling of depression but also unnerves so much. Therefore, education authorities and responsible bodies are urged to take action in order to redress the balance for improving female access to education in such a way that more female teachers are in a position to be seen in the teaching profession in general and in teaching physics in particular in the zone under consideration. In short, the issue of girls education should be given much consideration as well as due attention. Furthermore, despite the fact that experience is one of the top qualities an effective teacher requires, a small proportion of teachers with more experience and conversely a large portion of teachers with less experience are visibly observable from the data given in Table 2.

Table 3: Teachers Perception on the Importance of commonly used Instructional Material for Physics Instruction.

S.No	IMS	Respondent: Teachers (N=30)					
		Response Category					
		Important		Not Important		Total	
		N	%	N	%	N	%
1	Model	30	100	-	-	30	100
2	Experiment	30	100	-	-	30	100
3	Demonstrations	29	96.7	1	3.3	30	100
4	Text book	30	100	-	-	30	100
5	Graphs	30	100	-	-	30	100
6	Television	29	96.7	1	3.3	30	100
7	Blackboard	30	100	-	-	30	100
8	Charts	27	90	3	10	30	100
9	Diagrams	29	99.7	1	3.3	30	100

Table 3, explicitly elucidates that the absolute majority 30(100%) of the teachers perceived the IMS as important teaching devices. As can be evident from Table 3 above, hardly any teacher 3(10%) of the total expressed misgivings about the importance of IMS for physics instruction. According to Table 3, there seems to be a general consensus among the physics teachers regarding

the importance and judicious use of IMS to make learning more purposeful and interesting as well as to make teaching more effective.

Table 4: Availability of Commonly used Instructional Materials as Acknowledged by Physics Teachers from the Sample Schools (N=30)

S.No	IMS	Response Category					
		Available		Not Available		Total	
		N	%	N	%	N	%
1	Experiment	12	40	18	60	30	100
2	Demonstration	15	50	15	50	30	100
3	Models	16	53.3	14	46.7	30	100
4	Television	28	93.3	2	6.7	30	100
5	Textbook	30	100	-	-	30	100
6	Graphs	20	66.7	10	33.3	30	100
7	Black board	30	100	-	-	30	100
8	Charts	10	33.3	20	66.7	30	100
9	Diagrams	18	60	12	40	30	100
10	Radio	2	6.7	28	93.3	30	100
11	Bulletin Board	8	26.7	22	73.3	30	100

Table 4, relates to the availability of four categories of commonly used IMS at the selected sample schools. These categories include:

1. Visual materials

2. Audio materials
3. Audiovisual materials
4. Activity oriented teaching materials

Accordingly, 60% of the teachers admitted that experiment is not available. Similarly, 50% of them confirmed that demonstration is not available. However, 40%, and 50% of the teachers responded in the affirmative as regards the availability of experiment and demonstration respectively. As far as the availability of models, three- dimensional representation of real life objects, is concerned, 53.3% of the teaches replied in the affirmative while 46.7% of them gave their responses in the negative. All the teachers, 100% of them, replied in favor of the availability of textbooks and blackboard.

Graphs, charts and diagrams are two dimensional visual materials. They can be used to summarize, compare and contrast the relevant portions of the subject matter. Table 4 shows that 66.7%, 33.3% and 60% of the teachers ascertained the presence of graphs, charts and diagrams respectively. On the other hand, 33.3%, 66.7% and 4% of the teacher respondents responded the unavailability of graphs, charts, and diagrams respectively. Pertaining to bulletin board, the overwhelming majority of the teachers, (73.3% of them) replied in favour of the availability of the materials whereas 26.7% of the teachers gave negative response about the availability of these materials.

Television is an audiovisual material which involves two senses, namely, hearing and seeing. The more the sense of the learners are involved, the more effective learning will be. This suggests that it is through the senses that the learner observes, hears and learns. As indicated in Table 4, 93.3% of the teachers witnessed the presence of TV as an instructional device while a mere 6.7% of the teachers disagreed with the presence of TV in the sample schools. When it comes to radio as an audio teaching material, 6.7% of the teachers agreed with the presence of the item as an instructional device. However, the

absolute majority (93.3%) of the teachers disagreed with the availability of the item in their respective schools.

Availability of Kits

Table 5: Responses of Teacher Respondents on the Availability of Kits

Respondent	Response category				Total	
	Yes		No			
	N	%	N	%	No	%
Teachers (N=30)	14	46.7	16	53.3	30	100

Data in table 5, revealed that 46.7% of the teacher respondents agreed with the availability of kits containing a variety of IMS that are useful for physics instruction. On the contrary, 53.3% of the teachers responded in the negative.

Table 6: Teachers Extent of use of the available IMS in physics instruction

Respondents	Frequency								Total	
	Always		Sometimes		When the need arises		Never			
	N	%	N	%	N	%	N	%	N	%
Teachers (N=30)	-	-	10	33.3	5	16.7	15	50	30	100

Teacher respondents were asked how often they make use of the available IMS to help their students learn effectively. Table 6, above indicates the responses from the respondents concerning how frequently they use IMS to accomplish their teaching tasks.

In accordance with this, half (50%) of the teacher respondents offered negative reply, pinpointing that they never make use of IMS to improve instruction.

The responses obtained from an interview conducted with student interviewees are in agreement with this fact. An item with a fixed response (Yes/No) in an interview was presented to the interviewees to be checked. All the student interviewees responded witnessing the fact that physics teachers do not make use of IMS to supplement physics instruction.

The remaining 33.3% and 18.7% of the teachers responded that they utilize IMS 'some times' and 'when the need arises' respectively. It is obvious that students learn primarily through the senses, by listening, observing, feeling, doing and communicating ideas. Put concisely, learners learn best by doing. But this will become a reality only when teachers make proper use of IMS during instruction. The disappointing fact in this regard is that the findings of Table 6, stand in sharp contrast to the idea that practical teaching should be based on the proper use of IMS so as to heighten the quality of learning, because the largest proportion of the teachers admitted that they never use IMS during instruction.

Use of physics lab by physics teachers to provide Learners with first hand experience as well

Physics teachers drawn from the selected sample school were asked whether or not they use physics lab for carrying out demonstration experiments and for the performance of practicals by the students.

Table 7, below, illustrates the responses given by the teacher respondents for the query raised.

Table 7: Use of Physics Lab by Physics Teachers To Provide Learners with First Hand Experience

Respondent	Response Types					
	Yes		No		Total	
	N	%	N	%	N	%
Teachers (N=30)	11	33.7	19	63.3	30	100

As is evident from Table 7, the majority of teachers (i.e. 63.3%) do not use physics laboratories despite the fact that the teaching of science, and of physics in particular, without the help of a laboratory is a futile attempt. Moreover, it is apparent from the table that only a small portion of the respondents (i.e. 33.7%) replied in the affirmative with respect to the use of laboratories.

Reasons for the Inability of Physics Teachers to use Physics Lab to Supplement Instruction

Table 8, presents reasons offered by the physics teachers for their inability to use physics lab to supplement physics instruction.

Table 8: Responses of Teachers for not Using Physics Lab

S. No	Reasons	Respondent	
		Teachers (N=30)	
1	Absence of lab sessions	11	36.7
2	Unavailability of phys lab	5	16.7
3	No lab technician and manual	2	6.7
4	Lack of equipment time and materials	10	33.3
5	Heavy teaching load	2	6.6
	Total	30	100

Teacher respondents were asked why they were not able to use physics lab to support physics instruction. Table 8, summarizes the responses given by physics teachers for their inability to utilize physics laboratories to augment the effectiveness of physics instruction.

Accordingly, the highest proportion of physics teachers (i.e. 36.7%) said that they were not able to use laboratories due to the absence of lab session in their respective schools. The second largest proportion (33.3%) of the physics teachers forwarded lack of equipment, time and materials in justification of their failure to use physics laboratories in order to enhance instruction.

The remaining 16.7%, 6.7% and 6.6% of the physics teachers reported their inability to make use of physics lab for the obvious reasons that there is no physics laboratory, no laboratory technician and manual, and the heavy teaching load teachers are required to bear, in that order. It seems that little or no attention is given to laboratory sessions at the schools found in the zone in question since the advent of plasma TV in to the country's secondary education system. Apparently, laboratory is an integral part of teaching physics. Experimentation not only verifies theories but also helps in clarifying misunderstanding or misconceptions. Furthermore, physics laboratory provides students with a variety of invaluable firsthand experiences to reinforce

physics principles and concepts. The findings of Table 8, attest that the current developing trend in respect of laboratory sessions in the zone under consideration needs particular emphasis and rectification, to say the least.

Adequacy of Physics Lab Equipment

Teacher respondents were asked about the adequacy of physics laboratory equipment in their respective schools. Table 9, summarizes the responses offered by the physics teachers.

Table 9: Adequacy of Equipment in Physics Laboratories

Respondents	Response category				Total	
	Yes		No			
	N	%	N	%	N	%
Teachers (N=30)	5	16.7	25	83.3	30	100

As clearly seen from the table, nearly all the teachers amounting to 83.3% of the total respondents responded that physics laboratories are not adequately equipped. As the data in the table indicates, an insignificant proportion of the respondents pinpointed the adequacy of physics lab equipment.

Physics is an empirical science, and is thus inherently a science of measurement. Students retain facts learnt in theory only if duly practiced in the laboratory. A physics laboratory is justified based on the required apparatus and other necessary equipment. Nevertheless, information provided in Table 9 is in stark contrast to the basic facts about the vital roles physics laboratories play. It seems that physics laboratories at the selected sample schools in West Shoa Zone are virtually dysfunctional, which consequently, vitiates the quality of physics instruction. Of course, a number of factors may account for the current situation of physics laboratories in the zone under consideration. Maybe it is due to financial or some other limiting factors.

Therefore, it is advisable that all responsible authorities and concerned bodies in the zone pay due attention to the issue and act in unison so as to reverse the trend.

Major Items That Phys Lab is Lacking

Table 10 relates to pieces of equipment physics lab runs short of. Teacher respondents were asked whether or not physics lab is adequately equipped. To respond to this question, the physics teachers checked more than one item which the physics lab is lacking in Table 10 addresses this issue as in the following.

Table 10: Inadequacy of lab Equipments

S.N	Inadequacy of items	Respondents (teachers N=30)
		Response in terms of frequency (f)
1	Working table	9
2	Table with gas point fitted to it	16
3	Projected platform	15
4	Demonstration table	8
5	Black board	7
6	Sinks	10
7	Stools	14

According to Table 10 above, 'lack' of table with gas point fitted to it is the most frequently mentioned problem of physics lab in the sample schools as confirmed by the physics teachers. The next most seriously felt problems of

physics lab, according to the table, are deficiencies of projected platform and stools respectively.

Table 8 and 9 discussed in the preceding sections substantiate these facts. This is because the responses of 33.3% of the teachers in Table 8 and 83.3% of the teachers in table 9 converge to the responses of teacher respondents in Table 10 with regard to the deficiencies of physics laboratories.

Furthermore, data in Table 10 revealed that lack of blackboard and demonstration table are respectively the least experienced problems of physics laboratories. In relative terms however, lack of sinks and working table are also serious problems endured by the physics laboratories as attested by the data in table 10.

Requisite Utilities for the Function of Physics Lab

Physics teachers were asked whether or not their respective school labs possess the necessary utilities such as water, gas and electricity.

Table 11 indicates the responses provided by the physics teachers as regards this question posed in the questionnaire.

Table 11: Availability of the Basic Utilities Necessary for Physics lab to Operate

Respondents	Response Type				Total	
	Yes		No			
	N	%	N	%	N	%
Teachers (N=30)	10	33.3	20	66.7	30	100

As is clearly visible from Table 11 the vast majority (66.7%) of the physics teachers ascertained that physics laboratories do not have the basic utilities to serve the purposes they are meant for. The rest (33.3%) of the teacher respondents replied that their physics labs are supplied with the necessary utilities.

Enabling Training Opportunity for physics Teachers

An item in physics teachers' questionnaire asked the respondents whether or not they participated in any workshop pertaining to the production and utilization of IMS. Table 12 below shows the responses given by the physics teachers to the query put to them.

Table 12: Training opportunity for physics teachers to enable them to produce and use IMS

Respondents	Response category				Total	
	Yes		No		N	%
	N	%	N	%		
Teachers (N=30)	8	26.7	22	73.3	30	100

Table 12 shows that 73.3% of the respondents did not have any training opportunity that may help them produce and use IMS. On the other hand, a smaller portion (i.e. 26.7%) of the respondents believed that they had undergone training pertinent to the production and use of IMS.

Teacher's Evaluation of Advantages they Gained from Training Opportunities

Teacher respondents were asked to evaluate the extent to which benefits are accrued to them by the training they received through workshop or seminars.

Table 13 below accounts for the information elicited from the teacher respondents about the question.

Table 13: Teachers evaluation of advantages they gained from Training opportunities such as workshops or seminars.

Response categories	Respondents	
	Teachers (N=8)	
	N	%
Very good	3	37.5
Good	4	50
Fair	1	12.5
Poor	-	-

As vividly illustrated in Table 13, out of those respondents who responded in favour of the advantages accrued from the training undergone, 50%, 37.5% and 12.5% of them rated the advantage gained as 'Good', 'very good' and 'fair', in that order. Adequate training as to how IMS are produced and utilized so as to offer quality teaching is quite essential for all physics teachers, yet it seems that the results of Table 13 above signify the fact that that most teacher respondents are less satisfied with the advantages accrued to them by the training received.

Physics Teachers Involvement in the Production of IMS

Physics teachers were asked whether they engage themselves in the production of IMS for physics instruction. Table 14 describes their responses.

Table 14: Teachers involvement in the production of IMS to enhance physics instruction

Respondents	Response Type				Total	
	Yes		No			
	N	%	N	%	N	%
Teachers (N=30)	13	43.3	17	56.7	30	100

According to the findings of Table 14, a sizeable portion (56.7%) of the physics teachers admitted that they do not engage themselves in the improvisation of IMS to provide effective and efficient instruction.

The information offered by student interviewees concerning teachers involvement in the preparation of IMS substantiates this truth. Student interviewees were asked whether physics teachers prepare IMS for use or not. With regard to this issue, a significant portion of student interviewees or 80% of them replied in the negative, explaining that physics teachers do not prepare IMS.

Nonetheless, a fairly small portion (43.3%) of the teacher respondents replied that they are involved in the production of IMS to heighten the effectiveness and efficiency of physics instruction. The potential benefit of IMS in imparting quality instruction is unquestionable. Therefore, in a poor country like Ethiopia where there is only limited financial resource, physics teachers are urged to take extra trouble over the production of IMS from locally available cheap materials along with their students. So, physics teachers teaching in West Shoa zone secondary schools are no exception.

As is apparent from table 14 above 43.3% of the total teacher respondents claimed that they prepare IMS to support the teaching of physics to their students. Hence, according to the claims made by this group of teachers, two-dimensional materials such as: charts, graphs, diagrams; and three dimensional materials such as models, motors, electroscope, electrophorus, periscope, rocket model, heater and rectangular coil for carrying current were produced or improvised. Amazingly, the information the researcher elicited through observation is quite contradictory to the claims made by this category of physics teachers. School pedagogical centers are places where IMS are produced and stocked up. However, in the light of the researchers observation most SPCs, in the sample schools are not functioning to serve the purpose they are intended for. In most of the sample schools SPCs are either closed down or nominally existing. In some schools, the function of SPCs shifted to activities that have no relevance to the purpose a SPC is intended for.

For example the SPC at Holeta secondary school is serving as a technical drawing department. Presumably, physics teachers who claimed to produce IMS may store the IMS they improvise at their departments as some physics teachers informed the researcher.

Teachers ratings of the level of cooperation SPC coordinators demonstrate for the preparation of IMS

An item in teachers questionnaires asked teachers to rate the status of SPC coordinators cooperation to prepare IMS. Table 15 below presents the ratings given by teacher respondents concerning this issue.

Table 15: Ratings of SPC Coordinators Cooperation in Producing IMS in the sight of Physics Teachers

Response categories	Respondents	
	Teachers (N=30)	
	N	%
Very high	-	-
High	7	23.3
Low	9	30
Poor	14	46.7
Total	30	100

It is noticeably observable from Table 15 above that most teachers, amounting to 46.7% of the respondents rated the cooperation exhibited by SPC coordinators in the production of IMS as 'poor', while 30% of the respondents rated the SPC coordinators cooperation as 'low'. On the other hand, a relatively small portion of the teacher respondents (i.e. 23.3%) replied that the cooperation SPC coordinators demonstrated in the production of IMS is 'high'. As is evident from Table 15 above, none of the respondents rated the SPC coordinators cooperation as 'very high.' As regards the cooperation SPC coordinators show in producing IMS, most student interviewees attempted to evaluate it as follows: "It appears that there is hardly any effort exerted by SPC coordinators. Hence, there is no visible activities carried out at SPCs". In actual fact, this implies that the evaluation of the cooperation of SPC coordinators by the student interviewees is more akin to the judgment of most teacher respondents, who judged the cooperation of SPC coordinators as 'poor'.

Judgment teacher respondents made about the contribution of SPC in improving the teaching learning process

Physics teachers were asked to evaluate the contribution of SPC in enhancing the teaching learning process. Table 16 summarizes the responses teacher respondents provided.

Table 16: Extent of teachers' evaluation of SPC contribution in improving the teaching-learning process

Response category	Respondents	
	Teachers (N=30)	
	N	%
Adequate	4	3.3
Inadequate	5	16.7
Poor	8	26.7
Dysfunctional	13	43.3

As clearly seen from Table 16 above, a high portion of the teacher respondents, constituting the equivalent of 43.3% of the total, ascertained that the SPCs are dysfunctional, let alone contribute something to the teaching learning process.

The rest, 13.3%, 16.7% and 26.7% of the respondents, evaluated the contribution SPC give to the teaching learning process as 'Adequate', 'Inadequate', and 'poor' respectively.

The findings of Table 16 above, certainly accord with the evidence the researcher obtained through observation, which attested the fact that most of the SPCs at the selected sample schools are either closed down or nominally present.

Teachers' ratings concerning the support and encouragement school directors give to the production and utilization of IMS

Table 17, relates to the ratings given by the teacher respondents.

Table 17: School directors support and encouragement for the production and utilization of IMS as reacted by teacher respondents

Type of Response	Respondents	
	Teachers (N=30)	
	N	%
Very High	1	3.3
High	8	26.7
Low	14	46.7
Very Low	7	23.3
Total	30	100

Table 17, indicates that out of 30 teacher respondents, 14(46.7%) of them revealed that the support and encouragement given to the production and utilization of IMS on the part of the school directors is 'low'. And again, of the total respondents, 7(23.3) of them attested that the support and encouragement school directors provide for the production and utilization of IMS is 'very low'. Seen from the vantage point of the positive effect of IMS on the teaching-learning process, it seems that there is a blatant disregard for the roles IMS play in physics instruction on the part of the school directors. Only very few teachers, 1(3.3%) and 8(26.7%) of the total respondents witnessed that the support and encouragement given by the school directors for the production and utilization of IMS is 'very high' and 'low', in that order.

Frequency of giving assignments to students to produce IMS to help them learn by doing as given by physics teachers

An item in teachers' questionnaires asked the physics teachers 'how often' they assign their students to produce IMS. Table 18 illustrates the responses offered by the teachers.

Table 18: Frequency of Assigning Students to Produce IMS by Physics Teachers

Response	Respondents	
	Teachers (N=30)	
	N	%
Frequently	2	6.7
Sometimes	13	43.3
Rarely	11	36.7
Never	4	13.3
Total	30	100

Table 18 above clearly shows that out of 30 teacher respondents, 13 (or 43.3%) of them replied that they assign their students to produce IMS every now and then. Similarly, a relatively significant portion of the respondents, which accounts for 36.7% of them believed that they 'rarely' assign their students to prepare IMS. Only a negligible portion of the teacher respondents, i.e. 2 (or 6.7%) of them acknowledged that they 'frequently' assign their students to prepare IMS to help them learn through doing. Out of the total teacher respondents, 4(13.3%) of them, however, replied that they 'never' assign their students to prepare IMS. As Table 18 above suggests, it appears that physics

teachers in West Shoa Zone secondary schools have not given due attention to the benefits derived from the use or production of IMS.

Major problems confronting physics teachers to make use of IMS for physics instruction

Physics teachers were asked to check one or more problems they encounter which are suggested as alternatives for an item contained in teachers' questionnaires. Table 19, summarizes the responses given by physics teachers concerning the query posed to them.

Table 19: Major Stumbling-Blocks Confronting Physics teachers while making use of IMS for physics instruction

Item	Respondents
	Teachers (N=30)
	Response in terms of frequency (f)
Lack of training	9
Lack of interest	-
Ineptitude for manipulation of IMS	10
Lack of time and equipment	16
Lack of financial and material support	15

Note: f= frequency – measures the magnitude of the problem respect to on severity basis.

Table 19 shows the two most severe problems or obstacles teachers are confronted with while using IMS for instruction. These are: 'Lack of Time and

equipment’, and ‘Lack of financial and material support as the level of their severities are measured by the frequencies 16 and 15 respectively. According to Table 19 inadequacy of training and teacher’s ineptitude for manipulating IMS also rank high in their severity as attested by the teachers themselves. The results of Table 19 are consistent with the findings obtained from Table 17, in which the vast majority of teachers verified the fact that the support and encouragement given by school directors for the production and use of IMS is low or very low. Furthermore, the teachers commented that they found problems such as lack of incentives and guide materials quite excruciating, leading to lack of motivation.

Prevailing Conditions of SPCS

Physics teachers were asked whether SPCs at their respective schools are fully operational or not. Table 20 presents the responses physics teachers offered with respect to this issue.

Table 20: Conditions of SPCs: are they fully operational?

Respondents	Response category				Total	
	Yes		No			
	N	%	N	%	N	%
Teachers (N=30)	4	13.3	26	86.7	30	100

Quite obviously, Table 20 indicates nothing but the bare facts that the absolute majority or 86.7% of the teacher respondents reported that the SPCs are not fully operational while an insignificant portion (13.3%) of them responded in the affirmative. It turns out that the results of Table 20 are in consonance with the researcher’s observation, which disclosed the fact that nearly all the SPCs at the sample schools in West Shoa zone have been closed down or nominally existing. With regard to this issue the teachers were asked to give the reasons why the SPCs are not functional. Their responses follow in brief:

- No responsible person who is in charge of the SPC.
- Poor school management due to the replacement of school directors with amazing rapidity.
- No SPCs at the schools
- Lack of raw materials and tools for the production of IMS.
- Lack of time since most time is devoted to TV lesson transmission.

Current status of school physics labs: Are they fully functional?

An item in physics teachers questionnaires asked whether physics labs are functional or dysfunctional. Table 21 represents the teachers' responses.

Table 21: The current status of school physics lab

Respondents	Response				Total	
	Yes		No		N	%
	N	%	N	%		
Teachers (N=30)	8	26.7	22	73.3	30	100

According to Table 21 the highest proportion (or 73.3%) of the teacher respondents explained that physics labs at the sample schools in West Shoa Zone are not functional. A small portion, i.e. 26.7% of the teachers however, replied that physics labs are currently fully operational in the selected sample schools of West Shoa zone. The researcher attempted to make observations so as to assess the current status of physics labs at the selected sample schools. In accordance with this, most physics labs, besides being dilapidated, were found to be dysfunctional or nominal. As far as the conditions of physics labs in this zone are concerned, physics teachers were asked why physics labs are not in operation. In this regard, the physics teachers explained their reasons in the following manner:

- No qualified or trained lab technicians.

- The available labs are virtually converted into storerooms.
- Lack of good management
- No physics lab at all
- Inadequate lab equipment
- No lab session inasmuch as most teaching time is devoted to transmissions of TV lessons.
- Almost all the necessary apparatus and equipment for lab operation is absent.
- Inadequacy of lab materials such as lab manuals and the like.

Adequacy of IMS As Evaluated by Physics Teachers

Teacher respondents were asked to evaluate the adequacy of IMS at their respective schools. Table 22, describes the responses provided by physics teachers concerning the issue.

Table 22: Adequacy of IMS at the sample schools as evaluated by Physics teachers

Response category	Respondents	
	Teachers (N=30)	
	N	%
Sufficient	5	16.7
Insufficient	13	43.3
Meager	2	6.7
Poor	10	33.3
Total	30	100

Table 22 indicates that majority of the teachers (43.3%), judiciously expressed their judgment in line with the insufficiency of IMS at their respective schools.

Again, a relatively significant portion of the physics teachers evaluated that the adequacy of IMS at their schools is 'poor'. In addition, 6.7% of the teachers said that the adequacy of IMS at the sample schools is meager. Eventually, a small portion or 16.7% of the teacher respondents, however, witnessed that they have sufficient IMS at their respective schools.

Attitudes of physics teachers towards the use/ advantage of IMS Teacher respondents were asked to indicate the degree of strength of attitude they have towards IMS. Five alternatives, ranging from strongly agree (5) to strongly disagree (1), were provided. However, for convenience's sake, the five alternatives were reduced to three by combining the two outside categories strongly agree plus agree and strongly disagree plus disagree, hence ranging from agree (3) to disagree (1). Table 23 below presents the results.

Table 23: Teacher attitude towards the benefits of IMS in instruction

Statement	Response (N=30)						Total	
	A		UD		DA		N	%
	N	%	N	%	N	%		
IMS can crystallize ideas and clarify certain concepts of phys like speed, motion, force, temperature, etc.	30	100	-	-	-	-	30	100
IMS provide a more direct form of experience to facilitate hearing, seeing, doing and trying.	29	96.7	1	3.3	-	-	30	100
IMS help the teacher in capturing the attention of his students	29	96.7	1	3.3	-	-	30	100
IMS have meager effectiveness in the teaching learning process	12	40	5	16.7	13	43.3	30	100
Utilization of IMS for the instruction of any subject may cause the learners to feel confused and distracted	2	6.7	2	6.7	26	86.6	30	100
IMS may serve as rich resources of illustration and sensory experience for learning	30	100	-	-	-	-	30	100
IMS may be used to motivate interest, to communicate basic facts, to clear up, misconception and deepen understanding	29	96.7	-	-	1	3.3	30	100
IMS are both tools for teaching and avenues for learning	26	86.7	3	10	1	3.3	30	100

Table 23 (contd)

Statement	Response (N=30)						Total	
	A		UD		DA		N	%
	N	%	N	%	N	%		
IMS may free the teacher from repetitive and burdensome task of giving information for more creative work with his/her students	24	80	2	6.7	4	13.3	30	100
IMS function to facilitate desirable student action	24	80	2	6.7	4	13.3	30	100

As vividly seen from Table 23 above, the opinions of the vast majority of teacher respondents are most favourable towards IMS. This implies that physics teachers at the sample schools of West Shoa Zone are well aware of the benefits accrued to them by use IMS for physics instruction, though they hardly ever utilized IMS for effective teaching as this study revealed.

As per the results of Table 23 above, if conditions are made conducive, it seems that physics teachers at the selected sample schools of West Shoa Zone may demonstrate more inclination to use IMS for effective and efficient instruction, seeing that almost all the teachers have no attitude problems towards IMS.

Adequacy of Training Opportunity given to SPC coordinators

Table 24 below provides the responses of school directors and SPC coordinators about the adequacy of training SPC coordinators received.

Table 24: Adequacy of Training SPC coordinators received to provide appropriate services to the users of SPC

Respondents	Responses Type				Total	
	Yes		No		N	%
	N	%	N	%		
SPC coordinators (N=5)	3	-	2	-	5	-
School Directors (N=12)	3	25	9	75	12	100

Table 24 indicates that out of 12 school directors nine (75%) of them responded in the negative, witnessing the inadequacy of training undergone by the SPC coordinators, while three of the SPC coordinators replied in the affirmative, witnessing that they have received adequate training. The evidence which the researcher obtained through observation with regard to the status of SPCs and of the coordinators is actually in line with the responses of the school directors concerning the adequacy of training undergone by the SPC coordinators. The SPC coordinators seem unwilling to offer credible and truthful responses lest they should be threatened by the directors thereafter. This may be the case, according to the researcher's belief, since it is the directors who predominantly played the roles of distributing and collecting the questionnaires at their respective schools. On the other hand, only a relatively small portion of the school directors, i.e. three (25%) of them admitted that there is adequate training for SPC coordinators. However, two of the SPC coordinators reported the inadequacy of training they have undergone.

Financial and material support given to SPC

School directors and SPC coordinators were asked whether SPCs are provided with financial and material support or not. Table 25 highlights their responses.

Table 25: Financial and material support received by SPCs so that they may function effectively

Respondents	Responses (N=5)				Total	
	Yes		No		N	%
	N	%	N	%		
SPC coordinators	3	-	2	-	5	-
School Directors	5	41.7	7	58.3	12	100

Apparently, the findings of Table 25 above revealed the fact that three of the SPC coordinators and 5 or 41.7% of the school directors attested that SPCs receive financial and material support so that they can perform their functions properly. In contrast, two of the SPC coordinators and the highest proportion or 58.3% of the school directors ascertained that SPCs are not provided with the necessary financial and material support. Here again, the responses of the SPC coordinators seem far from reflecting the realities of the SPCs in the sample schools selected for the study in West Shoa Zone.

Budget allocation by the schools for the production and utilization of IMS

SPC coordinators were asked whether or not budget is allocated for the SPC in order to produce and utilize IMS. Table 26 represents the responses provided by the SPC coordinators.

Table 26: Availability of budget for SPC for the purpose of producing and utilizing IMS

Respondents	Responses		Total
	Yes	No	N
	N	N	
SPC coordinators (N=5)	2	3	5

The results of the above table shows that most SPC coordinators, three of them, explained that no budget is allocated for SPCs for the production and utilization of IMS, which is in direct contradiction to the responses of most SPC coordinators indicated in Table 25 in the preceding section.

In addition, the responses elicited from student interviewees in a semi-structured interview as regards the activities of SPCs confirms this fact. As far as the presence of budget for the function of SPCs is concerned, only two of the SPC coordinators responded in the affirmative, testifying to the allocation of budget for SPCs.

Services SPCs provide to improve the teaching learning process

SPC coordinators were asked to explain the type of services provided by the SPCS so as to augment the quality of learning. Table 27 provides the summary of the responses offered by the SPC coordinators.

Table 27: Types of services SPCs provide

Item	Responses (N=5)		Total
	Yes	No	
	N	N	N
Loaning school-owned materials (e.g. books, charts, models, mockups, displays etc.)	5	-	5
Helping to select IMS (for teachers and students)	4	1	5
Advice on utilization to help make the best use of IMS and other resources	3	2	5
Producing simple teaching materials	4	1	5

As elucidated by Table 27 above, only a small number of the SPC coordinators gave negative responses with regard to the afore-said services, but for the most part the responses offered by the highest number of SPC coordinators are positive. That is, among the services SPCs provide, loaning school-owned materials ranked highest in the hierarchy according to the results of Table 27. 'Helping to select IMS' and 'producing simple teaching materials' ranked second while 'advice on utilization to make best use, of IMS and other resources' ranked least in the hierarchy of services provided, according to the finding to Table 27.

According to the findings of Table 27, information given by most SPC coordinators about the services provided by the SPCs found at the sample schools appears to be unreliable since it has already been attested by 86.7% of the teacher respondent in Table 20 that almost all SPCs in West Shoa Zone secondary schools are not functional, and also seeing that the highest proportion of the school directors in Table 25 reported that the SPCs found at the sample schools are not provided with the necessary financial and material support. Furthermore, the researcher's observation substantiates this point, revealing the most terrible conditions of SPCs found at the selected sample schools in the zone under consideration.

Ratings of school directors and SPC coordinators related to the contribution of SPCs in improving learning

Both school directors and SPC coordinators were asked to rate the contribution of SPCs in facilitating learning.

Table 28: Highlights the responses offered by both the school directors and SPC coordinators

Table 28. Ratings of school directors and SPC coordinators as regards the benefits SPCs provide in enhancing learning

Respondents	response								Total	
	High		Average		Fair		Poor			
	N	%	N	%	N	%	N	%	N	%
SPC coordinators (N=5)	-	-	3	-	-	-	2	-	5	100
School Directors (N=12)	4	33.3	2	16.7	2	16.7	4	33.3	12	100

The findings of Table 28 show that most of the SPC coordinators, three of them, rated the contribution SPCS provide for the improvement of learning as 'average' whereas the remaining two of them judged the contribution of SPC in improving learning to be 'poor'.

When it comes to the school directors' judgment, however, out of 12, four (or 33.3%) of them rated the contribution SPCs give to the enhancement of learning as 'poor'. The same percentage of the school directors, i.e. 16.7% of them expressed their opinions about the benefits derived from SPCs to be 'average' and 'fair'.

Use of SPCs by teachers to produce IMS

SPC coordinators were asked whether physics teachers use SPC for the production of IMS. Table 29 represents the responses given by the SPC coordinators in respect of this issue.

Table 29: Use of SPCs by physics teachers for the production of IMS in the eyes of SPC coordinators

Respondents	Response		Total
	Yes	No	
	N	N	N
SPC coordinators (N=5)	4	1	5

The results of Table 29 clearly shows that the highest number of the SPC coordinators replied in the affirmative, revealing the fact that physics teachers use SPC in order to produce IMS.

Nevertheless, the responses of physics teachers regarding this issue, stand in sharp contrast to that of the SPC coordinators inasmuch as a significant portion of physics teachers themselves witnessed that they are incapable of using SPCs for various reasons (see Table 14).

Conversely, Table 29 illustrates that only an insignificant portion of SPC coordinators responded that physics teachers are not using SPCs for producing IMS.

Problems SPC coordinators are confronted with in producing IMS

SPC coordinators were asked whether or not they face problems while producing IMS. Table 30 describes the responses provided by the school pedagogical center coordinators.

Table 30: problems SPC coordinators encounter in producing IMS

Respondents	Response		Total
	Yes	No	
	No	No	No
SPC coordinators (N=5)	4	1	5

As clearly seen from Table 30 above, majority of the SPC coordinators admitted that they are confronted with various problems in producing IMS, while only an insignificant portion of SPC coordinators said they have no problems in producing IMS. Almost all the SPC coordinators are in agreement that they confront such problems as the ones that follow:

- Teachers apathy towards using IMS
- Shortage of time and equipment
- Lack of financial and material support
- Inadequacy of training

SPC coordinators attitudes towards the benefits of IMS

Table 31 presents the attitudes expressed by the SPC coordinators

Table 31: Attitudes of SPC coordinators towards IMS

Statement	Response (N=5)			Total
	A	UD	DA	
	N	N	N	N
IMS make learning more purposeful and interesting	5	-	-	5
IMS make teaching effective and efficient	5	-		5
Utilization of IMS result in wastage of time and energy	1	1	3	5
IMS act as motivators	5	-	-	5
IMS are capable of inculcating scientific attitudes in the minds of the learners	4	-	1	5

Evidently, the results of Table 31 above indicate that most of the SPC coordinators have positive attitudes towards IMS. That is to say, according to Table 31, the opinions of nearly all SPC coordinators on the benefits of IMS unquestionably coincided. Taking cognizance of this fact, SPC coordinators at the sample schools in West Shoa Zone are more likely to strengthen SPCs by improvising IMS so long as conditions are favorable to them. On the other hand, only a negligible portion of the SPC coordinators seemed to have inadequate awareness about the roles of IMS since it is only this portion that expressed misgivings about the advantages of IMS.

Use of locally available materials by physics teachers for physics instruction in the eyes of school directors

School directors were asked whether physics teachers use locally available materials for physics instruction or not. Table 32, sets forth the responses offered by the school directors to the query put to them.

Table 32: Use of locally available materials for physics instruction by physics teachers as observed by school directors

Respondents	Response					
	Yes		No		Total	
	N	%	N	%	N	%
School Directors (N=12)	8	66.7	4	33.3	12	100

As per the information provided in Table 32, most of the school directors or 66.7% of them agreed that physics teachers use locally available materials for the purpose of physics instruction. To the researcher's astonishment, however, the responses of student interviewees to semi structured interview are pretty

contradictory to the information given by the majority of school directors. Student interviewees expressed their views as regards this issue as follows:

“We are well aware about the advantages gained from the use of IMS, and yet we never see our physics teachers using IMS to make learning easy for us, thereby increasing our understanding and retention power”.

On the other hand, a relatively small portion of the directors disagree with the fact that phys teachers use locally available materials for instruction.

Supervision made by directors to check whether physics teachers use IMS for instruction

School directors were asked whether or not they supervise physics teachers to check their use of IMS. Table 33, summarizes the responses given by the school directors.

Table 33: Use of IMS by physics teachers as supervised by school directors

Respondents	Response					
	Yes		No		Total	
	N	%	N	%	N	%
School Directors (N=12)	10	83.3	2	16.7	12	100

The results of Table 33 indicate that the highest proportion of the school directors at the sample schools explained that they do supervise that physics teachers use IMS to teach physics to their students. However, the position of the directors on this issue seems to be untenable since most teacher respondents and student interviewees pointed out that generally use of IMS is

hardly ever made to enhance physics instruction for the simple reason that there is no sufficient time and materials available.

Conversely, only an insignificant portion of the school directors disagreed with the fact that supervision is made by them to check whether physics teachers use IMS for physics instruction.

Discussion of Data

The discussion predominantly concentrates on the results of the study presented thus far; and the results, in turn, provide information relating to the availability, adequacy, utilization, selection and production of IMS. Interpretations will be put on the results obtained from the research investigation besides.

Views of physics teachers and SPC coordinators about instructional materials

Apparently, instructional materials are tools that teachers use to implement a particular learning task by enriching the instructional strategy employed. The results of the current study revealed that nearly all physics teachers and SPC coordinators in the sample schools perceived IMS as important teaching devices. This suggests that the opinions of substantial proportions of physics teachers and SPC coordinators are most favorable towards IMS, which is reflective of the general unanimity in the views of physics teachers and SPC coordinators concerning the benefits derived from the use of IMS for instruction. So the attitudes of the teachers and SPC coordinators do not seem to be inhibiting factors for the physics teachers as well as SPC coordinators to spare no efforts in their attempts to use or develop IMS.

Put simply, there is no negligence attributable to attitudinal problems to use or develop IMS on the part of physics teachers as well as SPC coordinators, as revealed by the results of the study.

Availability of Instructional Materials for Physics Instruction

Use of available IMS is capable of eliciting active participation rather than an inert, passive response to the learning experience (causing the learner to do some thing ... rather than sitting and listening or watching) (Brown, 1997, PP. 27-28)

As far as the availability of commonly used IMS at the sample schools in West Shoa Zone is concerned, the findings of this study show that three-dimensional self-explanatory IMS such as experiment and demonstration are not available in adequate quantity despite their key roles in motivating interest, communicating basic facts, and deepening understanding.

It is customary to conduct experiments or demonstrations both in the classrooms and the laboratories, though predominantly in laboratories, as far as the researchers experience as a physics teacher is concerned. However, laboratories in most of the sample schools included in the study are in terrible condition, which is to be discussed elsewhere in the following section. It is the researcher's belief that for the most part, the unavailability of demonstrations and experiments may be due to this fact.

It can be deduced from this study that models, also being three dimensional IMS, are available in sufficient quantities despite they are hardly ever used by the physics teachers at the sample schools selected for the study, as is evident from the results of this investigation.

When it comes to the availability of two dimensional materials such as bulletin board, graphs and diagrams, the findings of this study disclosed that these materials are sufficiently available. The amazing thing is that physics teachers hardly use them at all. It is more likely that the teachers' inability to make use of these IMS for physics instruction will be due to some restrictive factors such as time constraint, inadequate training and the like, as proven by the findings of this investigation.

As regards the availability of the other categories of IMS such as television (audiovisual material), and radio (audio material), the research finding revealed that television, being one of the most important teaching materials, is sufficiently available while radio is scantily available despite being the most versatile and easiest to use.

Brown (1997) points out that radio, being one of the mass media resources, has certain other applications that deserve mention, the most important of which being to focus dispersed listening or discussion groups organized under the tutelage of monitors/ animators. Seen from this perspective, there seems to be a complete disregard for the instructional advantages accrued by radio in the sample schools drawn from West Shoa Zone of Oromia Regional State.

Availability of Physics Kits and Adequacy of Lab Equipment

According to the findings of this study, there are hardly any kits available and, in addition, physics laboratories are inadequately equipped in the sample schools included in the study.

Kits are containers in which some special apparatus and materials are stored for experimentation and demonstration by physics teachers or students. Given that there are modest support and encouragements on the part of the school administrations in terms of materials, money and time, physics teachers in

collaboration with their students can manage to develop and use such kits to serve the purpose of effective physics instruction.

Seen in context, however, it seems unlikely for physics teachers to discharge such tasks since there is meager support and encouragement provided by the school administrations as disclosed by the results of this study.

The issue of the inadequacy of lab equipment should also be a matter of considerable importance to all concerned. In essence, laboratories are activity-oriented that require the necessary equipment to help students learn by doing. That is to say, students learn most when they see things (i.e. pieces of lab equipment), handle or manipulate them. Nevertheless, current realities, as the results of this study suggest, reflect that laboratories are not only inadequately equipped but are also in terrible conditions with too much limited practical utility.

Findings in this study further revealed that laboratories in the sample schools are not fully functional despite their utilitarian values in providing for hands-on experiences to make physics instruction concrete and relevant for the students.

According to the researcher's observation to assess the current status of physics labs in the selected sample schools, physics laboratories, besides being dilapidated, were found to be dysfunctional or nominal. In respect of this, teacher respondents enumerated a whole lot of problems that the function of physics laboratories encountered in the sample schools of West Shoa Zone as follows:

- No trained lab technician.
- The available labs are partly converted into storerooms.
- Inadequate lab equipment

- No lab session since most teaching time is devoted to the transmission of TV lessons.
- Almost all the necessary apparatus and equipment for lab operation is absent, and the like.

A physics laboratory is a must for any school offering a physics course in order to carry out demonstration experiments by physics teachers and perform practicals by the students. However, the results of the study imply that there is inadequate provision for practical work to help learners gain first hand experiences. Moreover, it appears that lab activities have not received due attention in the selected sample schools since the advent of plasma TV into the country's secondary education system which, perhaps, led to the total absence of lab sessions.

Another most severe problem of phys lab in the sample schools is lack of basic utilities such as water, electricity and gas, according to the finding of this investigation. Apart from various provisions to be made in physics lab, there should be adequate gas, electrical and water services. Yet, according to the results of this study, such basic utilities in the sample schools included in the study are conspicuous deficiencies of physics laboratories. Of course, this issue is a matter of pressing concern as long as the functionality of phys labs is concerned.

Frequency of Teachers-use of available IMS to Improve Physics Instruction

Concerning the frequencies of teachers- use of the available IMS, the results of the study indicated that most teachers never used IMS to enhance physics instruction. However, only a few physics teachers managed to use the available IMS every now and then, according to the findings, of the study. As far as teachers professional responsibility is concerned, appropriate use of IMS by

physics teachers as instructional inputs, in order to achieve the desired learning outcomes, is compulsory regardless of the constraints confronted (e.g. time pressure and the like). In view of this, Reinhartz (1997:145) argues that IMS and resources provide students with a variety of learning experiences that can introduce, explain, reinforce and/or review concepts presented.

Training opportunity offered to physics teachers to enable them to produce and use IMS

As revealed by the findings of this research, the overall majority of the physics teachers did not receive any training that would enable them to produce IMS.

However, a mere 26.7% of the teachers have undergone training, as per the results obtained from the study. Certainly, adequate training received by teachers will enable them to develop competence, expertise and self-confidence, resulting in self-actualization. What's more, such opportunities will update teachers on current changes and developments in the realm of their academic studies, that consequently renders them effectual. Yet the finding implies that there is a reckless disregard for such training opportunities for physics teachers that is capable of increasing their efficiency and keep them up-to-date with current developments in science and technology. In this respect, it seems that physics teachers need to persevere with their efforts to keep abreast of science and new technology however difficult the chance of securing training may be.

Teachers and students involvement in the production of IMS

Results from this study revealed that most teachers do not engage themselves in the production of IMS for the provision of effective and efficient instruction. The study further indicated that only a few physics teachers purported to engage themselves in the improvisation of IMS. Apparently, production, selection and utilization of IMS are part and parcel of the implementation of

instruction or teaching tasks. In connection with this, Brown (1997:71) argues that creating IMS is a complex process with high learning potential, for both teachers and student.

In actuality, materials that students can manipulate or handle provide supplemental learning experiences. No physics teacher can afford to ignore the instructional values of IMS as far as their professional responsibility is concerned. IMS can be developed from locally available cost-effective materials by physics teachers together with their students under favorable conditions. Nevertheless the results of the study suggest that the present realities of the sample schools do not lend themselves for the teaches to accomplish such tasks due to a broad range of limiting factors (e.g. Time pressure, lack of support, resource, raw materials, tools, work space and the like).

It is also evident from the finding of the study that the involvement of the students in the production of IMS is low in spite of the fact that students participation in the production of IMS increases the amount and rate of student learning.

Level of Collaboration of SPC Coordinators to work with Physics Teachers

The research result regarding the level of SPC coordinators' collaboration to exert a concerted effort with physics teachers to produce IMS, shows that it is poor. It is incumbent upon SPC coordinators to act more not only as coordinators but also as facilitators when it comes to the production of IMS. Moreover, in order to enlist teachers help or support in the production of instructional materials, SPC coordinators are required to manifest a spirit of cooperation and goodwill. However, taking the evidence of the study into account, it seems that it is remiss of SPC coordinators not to demonstrate such

cooperation, though it may not be tantamount to abdicating their responsibilities.

Support and encouragement provided by school directors for the production and utilization of IMS

The study reveals evidence of low support and encouragement for the production and utilization of IMS on the part of the school directors despite the considerable learning potential IMS provide.

It is the duties and responsibilities of school directors to provide support and encouragement in terms of materials or money either by way of dealing with the concerned educational authorities or by way of soliciting funds or support from other organizations, be it governmental or non governmental. But the result of the study suggests that there is little incentive or effort made to take such measures on the part of school directors.

Conditions of SPCs: Are they fully functional? Is there financial and material support? Is there budget allocated for SPCs?

The findings of the study revealed that there is neither budget allocated nor financial and material support provided for SPCs in order to keep them functioning. Further more, the result of the study indicated that SPCs in the sample schools included in the study are currently dysfunctional or nominally existing. Under such circumstances, it is no wonder if SPCs in the sample schools of West Shoa Zone are not functional or nominal.

Rather worse, perhaps, is the blatant disregard for the terrific impact SPCs have on the teaching- learning process.

Adequacy of IMS at the Sample Schools

As regards the adequacy of IMS at the sample schools, the results of this study revealed evidence of insufficiency for instructional materials. IMS will be

available in adequate quantities provided that all the stake-holders, namely SPC coordinators, teachers, students, directors and other concerned education authorities play their part in strengthening and enriching SPCs. There should be provision for construction and utilization of IMS which requires raw materials, tools, work space, financial resource, no matter however modest it may be. Nonetheless, the finding verifies that there are no such visible activities aimed at rejuvenating the SPCs so that they can serve the purpose they are meant for at the sample schools selected for the study in West Shoa Zone of Oromia Regional State.

Adequacy of Training SPC Coordinators Received

As can be deduced from the results of the study, SPC coordinators did not receive adequate training to provide appropriate services to the users of the center. Unquestionably, training is part of the implementation of any curriculum. Hence, training is of a paramount importance to SPC coordinators in order to enable them to provide the necessary services to the users of the center as well as to keep them abreast of new changes and developments with regard to curriculum implementation.

However, the finding suggests that the overall trends and tendencies regarding the SPCs and the coordinators are becoming anomalous.

CHAPTER FIVE

5. Summary, Conclusion and Recommendations

5.1. Summary

This study attempted to assess the availability and utilization of IMS for physics instruction at some selected preparatory schools in West Shoa Zone of Oromia Regional State.

In order to conduct the study, both quantitative and qualitative approaches particularly a descriptive survey were adopted. Instruments of data gathering encompassed questionnaires, interviews and observation checklist.

As far as the sample population for the study is concerned, physics teachers, students, SPC coordinators and school directors were included.

The main findings of the study are:

- There is a general unanimity in the views of physics teachers and SPC coordinators regarding the benefits derived from the use of IMS for better instruction. That is the attitudes of physics teachers and SPC coordinators are not problematic for both the physics teachers and SPC coordinators to develop or use IMS.
- Commonly used three- dimensional IMS such as experiment and demonstration are inadequate in the sample schools of West Shoa Zone.
- Models, television, and two-dimensional materials such as blackboard, bulletin board, graphs and diagrams are adequately available, as uncovered by this investigation. However, radio is scantily available, even though it is known for its versatility.
- The investigation uncovered evidence of inadequate availability of kits at the sample schools in West Shoa Zone. Furthermore, laboratories at the sample schools included in the study are not adequately equipped. In

addition, physics laboratories are in such terrible conditions that their practical utility is too much limited. In other words, physics laboratories in the sample schools included in the study are not fully functional.

- As far as the frequency of teachers' use of IMS is concerned, most teachers never used IMS to supplement physics instruction. Only a few physics teachers were found to use the available IMS every now and then.
- Majority of physics teachers did not receive training that enables them to produce IMS.
- It has become evident that majority of physics teachers are not involved in the production of IMS for the provision of quality physics instruction. Neither are the students.
- The cooperation manifested by SPC coordinators to produce IMS with physics teachers and students was rated as 'Poor'.
- The support and encouragement provided by school directors for the production and use of IMS in the sample schools of West Shoa Zone is low.
- As uncovered by this investigation, there is neither budget allocated nor financial and material support provided for the SPCs at the sample schools selected for the study.
- The present study further revealed that SPCs are nominally existing, which are actually tantamount to dysfunctional ones.
- IMS at the sample schools of West Shoa Zone are insufficient, according to the supporting evidences obtained from most of the respondents.
- SPC coordinators have not undergone adequate training that enables them to provide appropriate service for the users of SPCs at the sample schools in West Shoa Zone of Oromia.

5.2. Conclusion

It is beyond doubt that IMS make valuable contributions to the success of teaching or learning. Various survey studies in Ethiopian situation suggest a strong deficiency in preparation, provision and utilization of instructional materials (Amare, 1999). West Shoa Zone of Oromia Region is no exception. This is actually what the current investigation undertaken in West Shoa Zone secondary schools has revealed.

According to the results of the present study, the attitudes of physics teachers and SPC coordinators were not identified as problematic particularity for physics teachers to use IMS to teach physics to their students. However, shortage of commonly used IMS was recognized as the single most serious problem physics instructional suffered at the sample schools in West Shoa Zone. The deficiency of physics kits at the sample schools of West Shoa Zone was identified as another most crucial problem by most physics teachers.

As far as the status of physics laboratories in the sample schools is concerned, they are not only inadequately equipped but are also nominal.

Pertaining to the utilization of the available IMS, majority of the physics teachers disclosed that they did not use IMS to augment the effectiveness of physics instruction. However, a mere small portion of physics teachers used IMS every now and then.

Production of instructional materials is a formidable task that requires training. Nevertheless, the current study has uncovered the fact that physics teachers at the preparatory schools of West Shoa Zone have not undergone an enabling training to create IMS for the provision of good instruction.

As to the involvement of teachers and students in the improvisation of IMS, the results of this investigation indicated that majority of the physics teachers are not involved in the production of IMS; and the students are not engaged in the production of IMS either. It is quite easy to realize that the spirit of cooperation SPC coordinators manifest does matter a lot to enlist teachers or students help for the production of IMS at their respective schools. Nonetheless, the present study underscored the fact that the cooperation manifested by the SPC coordinators at the sample schools included in the study was rated as 'poor'.

When it comes to the support and encouragement provided by school directors for the production and use of IMS, the finding has shown that school directors received low rating with regard to this issue.

As regards budget allocation and financial and material support for SPCs, the present study confirmed that there is no budget nor financial and material support at the selected sample schools of West Shoa Zone of Oromia Region.

Furthermore, the nominal existence of SPCs at the sample schools has become evident from this study.

As far as the adequacy of IMS at the secondary schools in West Shoa Zone is concerned, the findings of this investigation have underlined strong deficiencies.

The results of the present study also uncovered evidences of inadequate training received by SPC coordinators at the sample schools of West Shoa Zone included in the study.

5.3. Recommendations

5.3.1. Inadequacy of IMS

The terrific effect of IMS for instruction is unquestionable. Therefore, teachers, students, directors, and all concerned education authorities should strive to play their part in order to produce IMS for the success of effective teaching.

5.3.2. Shortage of Physics Kits and Laboratory Equipment

Shortages of Kits and laboratory equipment imply inadequate provision for practical work, which no physics instruction can afford. Students will acquire first-hand experience so long as they are hands-on with kits and pieces of laboratory equipment while learning. Hence, much consideration and due attention should be given to take administrative measures for the improvement of this situation. In addition to this, the issue of time for laboratory session is doubly important so that there will be double periods for practical work in laboratories or classrooms.

5.3.3. Utilization of IMS

IMS are essential ingredients of instructional process. Utilization of IMS crystallizes abstractions with concrete referents and stimulates interaction or participation in an actual event. Therefore, teachers are required to make maximum use of IMS for instruction. Also, decision to make use of IMS need to be mandatory by the school administrators, rather than leaving it to the discretion of the classroom teacher.

5.3.4. Training

There is no question that training enables both teachers and SPC coordinators to develop greater competence, self confidence, knowledge and the necessary skills to discharge their duties and responsibilities. Hence, all concerned bodies should prioritize the issue of providing training for both teachers and SPC coordinators.

5.3.5. Production of IMS

SPC coordinators, teachers, and students can produce IMS from affordable and cost-effective local resources under favourable conditions. To this end, school directors and administrators are required to make such production arrangements.

Especially, school directors need to give commensurate incentives to the teachers and students as well as to SPC coordinators so as to make them take extra trouble over the production activities.

5.3.6. Budget, Financial and Material Support for SPCs

The current developing trend of SPCs at the sample schools is quite worrisome. Hence, quick action is imperative to reverse the trend. To this end there should be budget, financial and material support for the SPCs in order to strengthen and rejuvenate them into normal status.

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Appendix A
Addis Ababa University
School of Graduate Studies
Department of Curriculum and Teachers'
Professional Development Studies

A questionnaire to be filled by physics teachers

The intent of this questionnaire is to gather relevant information about the current status of the availability and utilization of instructional materials for physics instruction at the second cycle of some selected secondary schools in West Shoa Zone of Oromiya Regional State.

Information gathered through this questionnaire will be used only for the research purpose, and you are confidently assured that your responses will be held in strict confidentiality or anonymity.

Therefore, you are kindly requested to fill out the questionnaire genuinely and responsibly for it is the main determinant to the success of the study. The researcher would like to sincerely express his thanks to you in anticipation for devoting your time and energy to complete this questionnaire.

N.B. Writing your name on this questionnaire is not necessary.

Part I: Basic Information

1. Sex: _____
2. Name of the school _____
3. Educational Qualification:
 - a. College Diploma
 - b. B.SC
 - c. M.SC
 - d. Other _____
4. Years of teaching experience _____
5. Grade you teach _____
6. Average class size _____

Part II

Instruction: The group of questions given below is followed by possible alternative responses. Please indicate your response by selecting the appropriate alternative for each item. For items without alternative responses, please supply short written responses as appropriate.

1. Below is a list of instructional materials, please give your opinions about the instructional materials by saying 'Important' or 'Not important' for physics instruction.

Materials	Important	Not Important
Models		
Experiments		
Demonstrations		
Textbook		
Graphs		
Television		
Blackboard		
Charts		
Diagrams		

15. How do you evaluate the contribution of school pedagogical center in facilitating the teaching-learning process?
 - a. It is adequate
 - b. It is inadequate
 - c. Poor
 - d. It is totally dysfunctional
16. How do you rate the support and encouragement offered by the school directors for the production and utilization of instructional materials?
 - a. High
 - b. Very high
 - c. Low
 - d. Very low
17. How often do you assign your students to produce instructional materials to help them learn by doing?
 - a. Frequently
 - b. Sometimes
 - c. Rarely
 - d. Never
18. Which one is your major source for procuring the necessary instructional materials?
 - a. School libraries
 - b. School pedagogical center
 - c. Other schools found nearby
 - d. Public libraries found in the community
 - e. Other _____
19. What problems hinder you from making the best use of instructional materials for teaching purposes?
 - a. Lack of training
 - b. Ineptitude for the manipulation of instructional materials
 - c. Lack of interest
 - d. Lack of time and equipment
 - e. Lack of financial and material support
 - f. Other, specify _____
20. Is the school pedagogical center currently fully functional?
 - a. Yes
 - b. No

21. If your response to question #20 is "No", why?

Please specify the reason

22. Is the school physics lab currently fully functional?

a. Yes

b. No

23. If your answer to question #22 is "No", why?

Please specify _____

24. How would you evaluate the adequacy of instructional materials at your school?

a. Sufficient

b. insufficient

c. Meager

d. Poor

Part III

Instruction: For each of the following statements about instructional materials, please indicate your position using the scale by putting a tick mark (✓) against each statement.

<u>Likert Attitude Scale</u>	<u>Scale value</u>
Strongly Agree (SA)	5
Agree (A)	4
Undecided (UD)	3
Disagree (DA)	2
Strongly Disagree (SD)	1

No	Statement	SA	A	UD	DA	SD
1	Instructional materials can crystallize ideas and clarify certain concepts in physics like speed, motion, force, temperature, etc.					
2	Instructional materials provide a more direct form of experience to facilitate hearing, seeing, doing, and trying.					
3	Instructional materials help the teacher in capturing the attention of his students.					
4	Instructional materials have meager effectiveness in the teaching- learning process.					
5	Utilization of instructional materials for the instruction of any subject may cause the learners to feel confused and distracted.					
6	Instructional materials may serve as rich resources of illustration and sensory experience for learning.					
7	Instructional materials may be used to motivate interest, to communicate basic facts, to clear up misconception, and deepen understanding.					
8	Instructional materials are both tools for teaching and avenues for learning					
9	Instructional materials may free the teacher from repetitive and burdensome task of giving information for more creative work with his/her students.					
10	Instructional materials function to facilitate desirable student action.					

Appendix B
Addis Ababa University
School of Graduate Studies
Department of Curriculum and Teachers'
Professional Development Studies

A questionnaire to be filled by preparatory school directors/deputy directors

The main purpose of this questionnaire is to collect relevant information about the current status of the availability and utilization of instructional materials for physics instruction at the second cycle of selected high schools in West Shoa Zone of Oromia regional state.

Information gathered through this questionnaire will be used only for the research purpose, and you are confidently assured that your responses will be kept in strict confidentiality or anonymity.

Therefore, you are kindly requested to fill in the questionnaire sincerely and responsibly for it is the chief determinant to the success of the study.

So, the researcher would like to express his thanks to you in anticipation for devoting your time and energy to complete this questionnaire.

N.B. Writing your name on this questionnaire is not necessary.

Part I: Basic Information

1. Sex: _____
2. Name of the school _____
3. Qualification:
 - a. Diploma
 - b. B.SC/BA
 - c. M.SC/M.A
 - d. Other _____
4. Years of Experience _____
5. Position: Principal _____ Deputy Director _____

Part II: The Items

Instruction: The group of questions below is followed by possible alternative responses. Please indicate your response by choosing the appropriate alternative for each item.

For items without alternative responses, please supply a short written answer in each case.

1. How do you rate the instructional benefits of instructional materials?
 - a. Excellent
 - b. Very good
 - c. Good
 - d. Poor
2. The use of instructional materials at your school is:
 - a. Mandatory
 - b. Left to the teacher's discretion
 - c. Minimal
 - d. Not favorable
3. Does the school provide support and advice on utilization of instructional materials and help teachers make the best use of available materials and resources?
 - a. Yes
 - b. No

4. If your response to Question #3 is "Yes", how do you go about it? Please specify it concisely.

5. How do you rate the teachers inclination towards the production and use of instructional materials?

- a. Very high b. High c. Average d. Low

6. Does your school arrange for sharing experiences among the teachers with regard to the use of instructional materials?

- a. Yes b. No

7. If your answer to Question #6 above is "No", why? Please specify it in brief.

8. Can physics teachers at your school procure professional literature on utilization practices and principles?

- a. Yes b. No

9. How do you rate the contribution of the pedagogical center in facilitating learning?

- a. High b. Average c. Fair d, Poor

10. Is the pedagogical center at your school provided with financial and material support? a. Yes b. No

11. If your response to Question # 10 is "yes", what is the source?

- a. The school it self
b. The community found nearby
c. Aid organizations
d. Education bureau
e. Other _____

No	Statement	SA	A	UD	DA	SD
1	Lack of instructional materials leads to ineffectiveness in teaching					
2	Teaching materials can help avoid wasteful duplication of teachers effort and energy					
3	Instructional materials increase confusion and distraction when utilized for instructional purposes					
4	Instructional materials are highly indispensable for successful learning					
5	Instructional materials crystallize abstractions with concrete referents					
6	Teaching materials stimulate interaction or participation in actual learning situations					
7	They help learners visualize concepts and principles for observation					
8	Instructional materials increase boredom in the classroom					
9	Instructional materials add variety to the classroom					
10	Instructional materials clarify misconceptions and understanding					

Appendix C
Addis Ababa University
School of Graduate Studies
Department of Curriculum and Teachers'
Professional Development Studies

A questionnaire to be filled by pedagogical center coordinators

The intent of this questionnaire is to collect relevant information concerning the current status of the availability and utilization of instructional materials for physics instruction at the second cycle of selected secondary schools in West Shoa Zone of Oromia regional state.

Information gathered through this questionnaire will be used only for the research purpose, and you are confidently assured that your responses will be held in strict confidentiality or anonymity.

Therefore, you are kindly requested to fill in the questionnaire genuinely and responsibly for it is the major determinant to the success of the study.

The researcher is pleased to express his sincere thanks to you in anticipation for devoting your time and energy so as to complete this questionnaire.

N.B. Writing your name on this questionnaire is not necessary.

Part I: Basic Information

1. Sex: _____
2. Name of the School _____
3. Years of experience as a pedagogical center coordinator _____
4. Years of experience in teaching profession _____
5. Qualification _____

Part II: The Items

Instruction: The group of items below is followed by possible alternative responses. Please indicate your responses by selecting the appropriate alternative for each item. When you come across a question without alternative responses, please supply a short written response in each case.

1. Below is a list of services that may enhance the teaching- learning process. Please indicate your response by saying “yes” if the service is provided by the school pedagogical center and “no” otherwise.

No	Item	Yes	No
A	Loaning school- owned materials (e.g. Books, models, charts, displays, mock-ups and the like) to teachers or students for use.		
B	Helping to select instructional materials (for teachers and students)		
C	Advice on utilization to help make the best use of available materials and resources.		
D	Producing simple teaching materials		
E	Processing instructional materials (e.g. repairing, editing instructional materials)		
F	Arranging for experience exchange among physics teachers to improvise instructional materials from locally available materials.		

2. Are the materials in the center inventoried and maintained?
 - a. Yes
 - b. No

3. If your answer to question #2 is "yes", how often do you perform such tasks?

Please, specify it _____

4. Have you ever had any training opportunity pertinent to instructional materials?

a. Yes b. No

5. If your response to question # 4 is "Yes", please indicate the length of time you had undergone training.

a. A week

b. A fortnight

c. A month

d. A year

e. Other _____

6. Is there any financial and material support for the pedagogical center?

a. Yes b. No

7. If your answer to question #6 is "Yes", what is the source of support?

a. Education Bureau

b. The School

c. The community in the vicinity

d. Aid organization

e. Other _____

8. Is there any budget allocated by the school for the production and utilization of instructional materials?

a. Yes b. No

9. Is there any guide material designed to assist teachers as well as students to prepare and use instructional materials?

a. Yes b. No

10. How do you rate the advantage accrued by the pedagogical center to the teaching- learning process?
- a. Excellent b. Very good c. Good d. Fair
e. Poor f. Virtually nothing
11. Do physics teachers borrow instructional materials from the pedagogical center for use?
- a. Yes b. No
12. If your answer to question #11 is "Yes", how often do they borrow for use?
- a. Frequently b. Sometimes
c. Rarely d. Never
13. Have you ever participated in any workshops or seminar to up-date and improve your practical know-how for preparing instructional materials?
- a. Yes b. No
14. If your answer to question #13 is "yes", what was the duration of your participation?
- a. Two days
b. Five days
c. One week
d. Fortnight
e. One month
f. Other _____
15. Do physics teachers use the pedagogical center for the production of instructional materials
- a. Yes b. No

16. If your answer to Question # 15 is "yes", which of the following materials are produced by the teachers?
- Models and mockups
 - Charts
 - Diagrams
 - Pictures
 - Slides
 - Other _____
17. Do you use filing systems to list instructional materials produced by both the teachers and students?
- Yes
 - No
18. Do you face any problem in producing instructional materials?
- Yes
 - No
19. If your answer to question #18 is "yes", which of the following are the ones you encounter! You may give more than one answer.
- Teachers apathy towards the use of instructional materials
 - Shortage of time
 - Lack of financial and material support
 - Lack of adequate training
 - Shortage of equipment
 - All

Part III

Instruction: For each of the following statements regarding instructional materials, please indicate your position using the scale by putting a tick mark (✓) against each statement.

<u>Likert Attitude Scale</u>	<u>Scale value</u>
Strongly Agree (SA)	5
Agree (A)	4
Undecided (UD)	3
Disagree (DA)	2
Strongly Disagree (SDA)	1

No	Statement	SA	A	UD	DA	SDA
1	Instructional materials make learning more purposeful and interesting					
2	Instructional materials make teaching effective and efficient					
3	Utilization of instructional materials result in wastage of time and energy					
4	Instructional materials increase boredom in class room					
5	Instructional materials make learning more permanent					
6	They act as motivators					
7	Instructional materials are capable of inculcating scientific attitude in the minds of the students					
8	Instructional materials make learning experience functional					
9	Instructional materials have the power of attracting and holding the attention of the learners					

Appendix D

Interview Set for Preparatory Science Students

I. Basic Information

1. Woreda _____
2. Name of the School _____
3. Age _____
4. Grade _____ Sec _____
5. Class size _____

II. Interview Items

1. Could you explain the importance of IMS in learning Physics? _____

2. Do teachers use the available IMS to help you learn effectively? A. yes, B. No C. Don't Know
3. Do Physics teachers prepare IMS? A. yes, B. No C. Don't Know
4. Do you produce teaching materials as an assignment in order to learn by doing? A. yes, B. No
5. Does the school have pedagogical center? A. yes, B. No C. Don't Know
6. How do you evaluate the support and encouragement provided by pedagogical Center coordinators to produce and use IMS? _____

7. Could the use of instructional materials by teachers interest you? A. yes, B. No.
8. How do you evaluate the physics instruction offered through Television? _____

9. Is the contact time you have with your class room teacher sufficient? A. yes, B. No.

10. If your response to Questions#9 is yes how long is the contact time? _____

11. Do you have student guide which is helpful in phys Instruction Provided by TV? A. Yes B. No
12. Could you explain the adequacy of textbooks and reference materials for physics Instruction at your school? _____

13. Do you think the physics instruction provided by plasma TV can be a substitute for the instruction given by the actual class room teacher? A. Yes B. No
14. If your response to question#13 is 'yes' could you explain it briefly? _____
15. What comments do you have about the physics instruction provided by the TV? _____

Appendix E

Observation Checklist

1. Name of the school _____
2. Level of the school _____
3. Zone _____
4. Woreda _____
5. Does the school have pedagogical center? A Yes B No
6. Is it fully functional? A Yes B No
7. Is annual budget allotted for the pedagogical center?
8. Availability of Improvised and purchased IMS, A) Adequate B) Inadequate C) Virtually non existent
9. Is there physics lab? A Yes B No
10. Is the physics lab currently functional? A Yes B No
11. Is there a guide material for the production and use of IMS?
A Yes B No
12. Availability of equipment In physics lab: A Rich B Fair C Poor
13. Types of Instructional materials available at the school pedagogical center.

No	Type	Teacher-made	Student-made	purchased or Donated	Quantity	Condition	Remark
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

Declaration

I declare that this thesis is my original work. All sources of material borrowed to accomplish this thesis are equitably acknowledged.

Name Tesfaye Yadata

Signature 

Submission Date 30 June 2008

This thesis has been submitted for examination by my approval as a university advisor.

Name Teresza Freja

Signature 

Date of Submission June 30, 2008