

ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

EVALUATION OF THE IMPLEMENTATION OF SCIENCE
RADIO BROADCASTS IN THE PRIMARY
SCHOOLS OF ADDIS ABABA

TEFERA TADESSE

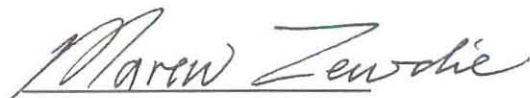
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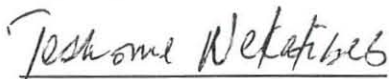
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BY
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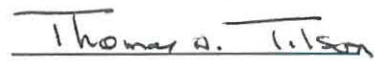



Advisor




Examiner




Examiner



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ABBREVIATIONS

A.A	Addis Ababa
BBC	British Broadcasting Corporation
CIPP	Context. Input process & product
DEMM	Development of educational mass media
EMA	Educational media Agency
EMMA	Educational mass media Agency
ICDR	Institute for curriculum Development and Research
IRI	Interactive Radio Instruction
MOE	Ministry of Education
NETP	New Education and Training policy
NESS	New Education Sector Strategy
NHK	Japan Broadcasting Corporation
PC	Pedagogical Center
REB	Region Education Bureau
SNNPR	Southern Nation & Nationally people Region
UNESCO	United Nations Educational, Scientific and Cultural organization
USAID	United States Agency for International Development.
ZEB	zone Education Bureau

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Good instruction is the function of various factors. This holds true because good instruction is not a mere transmission of the subject matter offered to the students. As Amare (1996) stated some of the factors include curriculum, media, and students. In fact, the paramount importance of these three factors in relation to good instruction is vivid. However, experience shows that the emphasis given to each of them may vary from one approach of teaching strategy to the other. For instance, in the message-centered approach the curriculum is the focused factor; whereas, in the media-centered approach the medium through which the content is transmitted gets emphasis. While in the learner-Centered approach due attention is given to the learner. Regardless of centeredness, the same author suggested an integrated approach that comprises a combination of the three factors. Furthermore, he often stressed that these three factors by and large determine fidelity (efficiency and effectiveness) of learning.

In addition, by taking into account the most important components of good instructional system, Knirk and Gustafson (1986) mentioned that learners, teachers, and curricular materials are the three factors that determine the use of media in education. They also pointed that the curricular materials and the teachers provide the structure and the environment within which formal learning and its evaluation can take place. In line with this, based on evidences from various experimental implementations in developing countries, Lockheed and Middleton (1991) highlighted learners' needs, learning environment, and teacher abilities as a crucial factor that determine the use of

instructional technology in education. With regard to the applications of instructional technology, Anzalone in Lockheed and Middleton (1991) noted that textbooks, audiovisual supplement, instructional radio, instructional television etc. are likely to be of interest for improving the quality of general education in developing countries.

In general, based on the above point of discussions, it is quite understandable that factors such as curriculum, media, learners, teachers, learning environment etc. determine the quality of education. Therefore, it is necessary to give careful consideration to all of them.

Because of its significant contributions to bring about qualitative and quantitative improvements of education, the roles and expectations of the use of media have broaden considerably from time to time.

As being one of the most important media, radio has been employed in different countries regardless of variation in its purpose. Almost from the time of its inception in the 1920s there has been interest in the role of educational radio (Jamison and McAnany, 1978: 12). In the course of its development, radio has been used successfully to teach subjects of any area of interest (Jamison and McAnany, 1978:12; Hawkrige and Robinson, 1982:24). It has been successful in providing direct instruction and in supplementing or enriching educational program (Jamison and McAnany, 1978:12; Hawkrige and Robinson, 1982:24; bates, 1984:19; Sampath and others, 1984:25). It has also served as an invaluable motivational device (Jamison and McAnany, 1978:18; Hawkrige and Robinson, 1982:24; Locatis and Atkinson, 1984:199).

When the work of the educational planner is looked at comprehensively, a threefold process emerges: planning and design; implementation of the design; and evaluation. The most common use of evaluation is to determine the effectiveness of a

program and the organization's. As Best and Kahn (1989) described evaluation primarily focuses on program effectiveness results. In view of that, Mohanty (1984) argued by saying that the successful development of educational broadcasting largely depends on the constant monitoring and Continuous evaluation. Even in the Utilization Evaluation report of (EMMA, 1991) Utilization evaluation is explained as an in built process in Educational Media Agency's operations.

As indicated above evaluation is a means not an end in the educational radio broadcasting. Therefore, it should be remembered that with a view to ensuring improvement of programmes, Constant feedback and evaluation service is essential.

Being well aware of the importance, the NETP (1994) document that has reorganized educational broadcasting in Ethiopia, emphasizes how evaluation has to be an in built process of educational media operations. Despite these concerns, however, Amare (1995) reported that not only does the need for research remain enormous; but also there have been only two descriptive studies concerning the medium over the last three decades.

1.1.Statement of the Problem

Although education is the cornerstone of development, pressure such as enrollment growth and demands for change and improvement in curricula are becoming major issues in many countries.

Educational radio is seen as a great assistance where the educational system has some particular deficiencies such as shortage of qualified teachers, lack of textbooks, and other educational facilities. Accordingly, educational radio broadcasts are intentionally prepared to support the classroom teacher, to enhance the teaching-

learning process and to be used as a learning resource in order to overcome some deficiencies of the educational system.

To alleviate the problems encountered in the educational system, Ethiopia has used radio broadcasting both in formal and non-formal education sectors. Currently there are four subject areas, which are produced and broadcasted to primary schools: Amharic (grade 1-6), English (grade 3-6), Science (grade 1-6) and Social studies (4-6). For each grade level the total number of Science radio programs is 28 of which 14 of the programs are broadcasted in the 1st semester and the rest 14 in the 2nd semester.

Though they are very few in number, a critical analysis on the research studies made so far dictated the reality that problems exist in various aspects of school radio broadcasts in Ethiopia. For instance, Hailu (1980) revealed that in Ethiopian primary schools, teachers, lack the necessary training on how to utilize educational radio broadcasts. In the research report of DEEM (1987), it was found out that the radio broadcasts lack interactive learning experience. Similarly, Awole (1987) reported that the content of English radio in Ethiopia is not effective. In addition to this, considering the methodology of English radio broadcasts, Almaz (1989) identified that the speed of presentation was not adjusted to the pupil's level of comprehension. In a similar vein based on content analysis, Tesfaye (1990) revealed the weakness of science radio broadcasts teaching methods. Moreover, by taking into account the nation wide operations of educational radio, Teshome (1998) identified the presence of considerable problems in Ethiopia. These include the division of labor between the center and regions, control of transmission between the center and regions, equitable distribution of production studios, financing development, production, training and research, as well as the development and implementation of high-level human resources.

Second, it explores the major and common problems encountered in implementing Science radio broadcasts.

Third, it creates a suitable situation that encourages others to undertake further study in the area of evaluating implementation of Science radio broadcasts.

Fourth, the study will serve as one of the crucial endeavors from the point of view of enhancing the quality of education.

As a feedback, the study is also considerably beneficial for production and continuous improvement of Science radio broadcasts.

1.6 Definition of Terms

Attitude-an acquired mental state that influences choices for personal action, such as preferences, avoidance, or commitment.

Constraint- refers to limitation that must be taken in to account

Educational radio broadcast-deals with the Production and transmission of radio programs, which are intended to enrich and supplement formal and non-formal education.

Evaluation- is a process of gathering detailed information to be used as a basis for judging the effectiveness of instructional program.

Implementation – refers to the actual use of the curriculum to put into practice what has been intended.

Implementation evaluation- refers to value judgment on the basis of evidence obtained from the actual use.

Interactive instruction-implies instruction that requires frequents responding from the student.

Primary schools- consists of grades from 1-4, 1-6 and 1-8.

1.7 Organization Of the Study

The content of the study was organized in to five chapters. Chapter one introduces the background of the study along with, objectives of the study, statements of the problem, limitation of the study, delimitation of the study, significance of the study, definition of terms used in the research paper. Chapter two presents review of related literature and research findings that are related to the problems under investigation. Chapter three and four deal with the Conceptual framework and methodology of the study and the report of the result and interpretations of the findings respectively. Chapter five summarizes the work of the investigation and presents conclusions drawn from the results of the investigations. Recommendations are also provided based on the findings of the study.

CHAPTER TWO

REVIEW OF RELATED LITERATURES

2.1 Media and Education

Education with its correlated activities of teaching and learning involves communication as well as reciprocal interaction between the teacher and students; the teacher and media; and, the students and media. Due to this reason there exists inseparable connection between education and media.

In its wider sense the term media refers to the physical means by which messages can be transmitted or delivered from a source to a receiver or vice-versa (Locatis and Atkinson, 1984:3; Gagne et al, 1992:208; Amare, 1999:53). Basically, when media are used for the purpose of instruction, they tend to take the students from a state of not knowing to one of knowing (Locatis and Atkinson, 1984:13). In this regard, educators such as Clark and Starr (1988:400); Henich and others (1989:5) remarked educational media as a decisive factor for effective and durable learning. Like wise, Amare (1999) after reviewing a number of studies, strongly argue that no teaching-learning activity takes place without media. He also distinguished media as one of the most important variables that causes maximum student learning.

From this point of discussion it is clear that media involves remarkable and meaningful contribution to the process of education. Hence, media should be considered as an indispensable part in the process of education.

Society's demand for increased educational excellence has resulted in several trends that are changing the fundamental aspects of traditional practices of education. As it is summarized by Norman (1977), some of the trends include: a great emphasis to

meet individual difference; deep concern for the process of systematically developing more meaningful instruction; an increased interest in developing alternatives to traditional programs; and, different ways of evaluating and certifying acceptable performance. Besides this, the same author further explained that implicit in these trends there is the assumption that a wide variety of media are available and used in the process of instruction. In connection to this, Lockheed and others (1994) disclosed that media should be critical ingredients in learning; otherwise, the intended curriculum cannot be easily implemented. For this reasons, media currently finds itself in the position of being assigned as an integral and indispensable part in the instructional process. Unfortunately, however, historic practice has assigned it the role of an aid or supplemental to the actual teaching (Norman, 1977:16).

Actually it is no longer accurate to limit discussions of media exclusively to the realm of auxiliary aids to the learning process (McAnany and May, 1980:11). Because the term "aids" implies that the materials and equipment involved are all "aids" which excludes the fact that they are part of the teaching learning process (Amare, 1995:4). Similarly, Alemayehu (1997) commented that the word "aids" makes it inadequate to represent the roles of educational media.

Therefore, based on the above points we can realize two things. First, it is absolutely wrong to assign educational media as an aid to the learning process. Second, the increased uses of educational communication have been improved the use of media in education.

2.2 The Meaning of Educational Media

Before going to the discussions of the role of media in education, we need first to define the term educational media. In the professional literature, educational media have

different names such as: audiovisual materials (Dale, 1969: 1; Davies, 1981:273; Clark and Starr, 1986:400; Callahan and Clark, 1986:240), instructional media (Heinich and others, 1989:5; Gagne and others, 1992:208; Alemayehu 1997:3 Seels and Glasgow, 1998:5), instructional technology (Wittich and Schuller, 1979: 5; Brown and others, 1985:158; Knirk and Gustafson, 1986:2), educational technology (Sampath and others, 1984: 1; Lockheed and Middleton, 1991:2) .

Regardless of using various names, the term educational media is used to represent "all of the various physical means by which an instructional message is communicated " (Reiser and Gagne, 1983:5; Haney and Ullmer; 1971:14; Amare, 1995:4). According to this definition, a printed text, an audiotape, an instructional radio program, a training device, a TV program, a teacher's talking, along with many other physical means, are all considered educational media

A number of different categorizations have also been suggested as meanings stated to reflect sensory channels, Size, involvement of senses, and audience. For instance, considering the sensory channel involved in the process, Davies (1981) categorized educational media as audio media and visual media. By audio media the author refers to those devices that demand more of hearing in the process of instruction. And, by visual media the author refers to those devices that demand more of seeing (showing) in the process of instruction. In this categorization, radio program, audiotape and a teacher's talking are considered as an audio media. On the Contrary, drawings, cartoons, realistic pictures etc are considered as visual media.

Taking into account size, Schramm (1977) categorizes educational media as big media and little media. By the "Big media," the author implies to the complex, expensive media like television, sound films, and computer assisted instruction. By the "Little

Media," the author implies to the simpler ones, which stretch all the way from slide films and projected transparencies to radio and programmed texts.

Based on involvement of Senses, McLuhan (1968) categorizes educational media as hot media and cool media. According to the author, hot means less participatory since it involves only one sense and cool means more participatory because it involves more than one sense. Hence radio is hot and TV is cool. He further argued that those media that encourage maximum involvement of senses are most effective in the process of instruction. Besides, he stressed the fact that in the cool media, students have more involvement in the process of instruction making learning more effective.

Taking into account the audience, Hancock (1976) categorizes educational media as teacher centered media and learner-centered media. By teacher centered media, he refers to the ones which help the teacher to present information to the whole class while learner-centered media are the ones which help students to work independently in a small group, in pairs or individually.

A critical survey on the above categorizations revealed that there is a single common thread running through all of them: educational media refers to the various materials and equipment employed in a process of instruction. As Teshome (1998) recognized several categorizations of educational media are complementary to each other. Therefore, in a broader sense educational media should be understood from this perspective.

2.3 The role of media in education

It is really difficult to undermine the functional role media could play in the process of instruction. And different scholars described the importance of media in

different ways. But what is important is how media are used and what they contribute to the process of instruction. Therefore, here we will try to discuss the “how” and “what” of media in the process of instruction.

To begin with, educational media are used to simplify instruction because they should not make the process complex (Davies, 1981:132). They are used in compiling and retaining student's attention (Heinich and others, 1989:5). They add variety to the learning process inducing greater attention and understanding (Brown, 1985:11). Being in favor of learner-centered media, Haney and Ullmer (1971) argued that students' involvement in their own learning through media would likely enhance their interest and motivation as well as their ability to communicate effectively. Some of the pedagogical values of educational media as Dale (1969) provided in his book audiovisual methods of learning include:

- Encourage students' active participation in the process of instruction there by helping students in skill development.
- Encourage creative thinking. Because educational media play a significant role to practice learning through active and practical involvement in various activities such as problem solving, experiments, assignments, which are necessary to facilitate learning through doing.
- Break away the physical limits of time and space. Events that are out of reach, out of sight and out of mind can come to classrooms with the help of educational media through concrete representations, a case that asserts the power of educational media to bring almost everything to the classroom.
- Encourage individualized learning and allow greater flexibility in the process of instruction. Educational media are helpful in carrying out diagnostic and remedial works

required to overcome learning difficulties of students and improve the teaching learning conditions.

- Overcome different barriers to learning that may originate during the instructional process. Particularly barriers that may lie in the channel area can at least be minimized through the proper selection and utilization of educational media that can help to provide clarity in the lesson and facilitate students understanding.
- Upgrade the instructional role of the teacher. They help the teacher to cease being mere dispenser of information consequently raises his/her role to the level whereby he/she can organize circumstances that provide the best opportunity for learning. In other words, he/she can take less time for talking and more time for planning and guiding students activities and evaluation of the instructional program. In short, educational media are necessary to make teachers effective classroom leaders and managers of instructional activities.

In sum, quite a number of advantages can be obtained from the utilization's of educational media. But there are three key points that we should be aware of along with understanding the importance of educational media. First, past research on media has shown quite clearly that no medium enhances learning more than any other medium regardless of learning task, learner traits, symbolic elements, and curriculum content (Gagne, 1965:365; Shramm, 1977:27; Clark and Salomon in Wittrock, 1986:474; Gagne and others, 1992:209). Second, media are not the only factors for better learning and their role is much powerful in conjunction with other variables (Alemayehu, 1997:8; Amare, 1998:58). Third, most writers on media selection model would initially agree that the functional role of media shall be realized through systematic selection and utilization

of the desired methods and materials (Clark and Salomon in Wittrock, 1986:474; 1988:284; Gagne, 1992:208; Alemayehu, 1997:8).

A critical survey on the above points indicate that educational media should not be determined in any case as cure-all tools in education. Rather, they should be considered as important instruments to overcome most of the problems of instruction. Thus, many of the obstacles to effective instruction can be overcome through selection and utilization of appropriate educational media.

Educational media in its wider sense is being referred to "educational technology". In this sense educational media goes beyond the sum of the physical items, tools or devices. As it is explained by Alemayehu (1997) educational technology is a systematic approach to the process of instruction based upon research in the human learning and communication. He also noted that the main objective of the use of educational technology is to bring about more effective instruction.

Broadcasts such as Radio and TV are some of the tools that may be used in solving an educational problem, therefore may be part of the technology of an educational system (Gough, 1982:213). Broadcasts have been used for a wide variety of purposes. Because plenty of intellectual skills have been successfully taught by broadcasts such as radio and TV when provision are made for students response (Bates, 1984:12; Gagne et al, 1992:209). In connection to this, based on the research findings of different scholars, Hawkrigde and Robinson (1982) pointed that educational broadcasts may even be the key to providing more education at lower initial cost without investing vast amounts in school buildings. They stress too the potential of educational broadcasts for achieving quick response in the educational system when changing national priorities demands curricular changes.

On the basis of the above description, it is quite clear that educational radio generally refers to radio programs designed to enhance learning in a systematic way. It can support both formal in-school education and non-formal, out-of school learning. In the former, it is not a matter of replacing teachers, but of integrating with the school programmes thereby facilitating the teachers' task.

2.4 Characteristics of Educational Radio

Educational radio generally refers to radio programs designed to enhance learning in a systematic way. While describing the main features of educational radio Sampath and others (1984) stated that the broadcast is made during specific days at specific school hours, mainly for the benefits of the educational institutions. The authors further explained that this broadcast is based on the prescribed syllabus of the curricular subjects, sequenced to synchronies with the class lesson. Similarly, after critically reviewing a number of studies, Hawkrige and Robinson (1982) list four characteristics of educational radio programs:

1. Arranged in a series to enable cumulative learning.
2. Planned in consultation with external advisors.
3. Accompanied by printed materials.
4. Followed by evaluation of programme use by teachers and learners.

The mode of instruction in the radio lesson may be an interactive or conventional one. Table2.1. helps to understand the difference between the main features of interactive and conventional radio instructions.

- Provide clear and straightforward instructions, which are consistent from programme to programme
- Incorporate response pauses that are neither too long nor too short, and activities that are neither too easy nor too difficult.
- Recognize and exploit the unique character of the medium, i.e., use sound effectively, personalize the program through the radio actors, respect and stimulate the listener's imagination.
- Use repetition and anticipate effectively.
- Begin and end each lesson in a standard way (often theme music).
- Use theme music or sound effects to introduce special segments.
- Use relaxation segments to break the intense concentration and attention listening require.
- Incorporate a variety of formats, such as physical activities, application segment dialogues and discussions, dramas, drills, quizzes, serials, songs, and stories.
- Accomplish program objectives through a harmonious blend of format (story plot and caricatures) and content.
- Provide clear guidance to the classroom teacher thorough training, complete program notes and on air instructions which enhance the teacher's self-esteem, confidence and ability.

2.5 Applications of interactive radio instruction

Based on evidence from instructional radio projects around the world, Tilson in Lockheed and Middleton (1991) confirmed that radio is a successful innovation in the primary classroom. In relation to this, Dock and Helwig (1999) reported that IRI continues to be an attractive educational strategy in developing countries. The same

authors further noted that since its inception in Nicaragua in 1970, at least 20 countries around the world have developed IRI programs for a variety of subjects, audiences, and learning environments. Some of the countries include: Kenya, Thailand, Dominican Republic and Papua New Guinea (Anzalone in Lockheed and Middleton, 1991:42). With regard to subjects, Dock and Helwig (1999) disclosed the development of IRI program for different levels of Mathematics, Science, Health, English, Spanish, Portuguese, Environmental education, for learners of all ages.

Recent case studies provide numerous indicators that IRI offers significant professional development possibilities for teachers. For example, Leigh and cash in Dock and Helwig (1999) reported that in Papua New Guinea, radio science teachers appreciate the opportunity to learn science along with their students because it has been handled in a way that does not embarrass them in front of their colleagues. Similarly, the same authors noted that in South Africa, English in Action teachers are being offered many new strategies for effective language teaching and are find a range of benefits.

IRI has also proven to be significant in improving student's academic achievement. In connection to this Mayo describes as follows:

IRI raise student achievement in specific academic subjects via broadcast lessons linked to other pedagogical innovations, innovations, including restructured curricula, teacher guides, and student worksheets such as IRI, projects in Nicaragua, Kenya, the Dominican Republic, Lesotho, Venezuela, south Africa, and other Countries (Mayo in Dock and Helwig 1999:2).

Based on interview results from south Africa, Leigh and cash in Dock and Helwig (1999: 28) reported that IRI has helped to stimulate pupils' interest towards schools as a result the number of absentees has dropped. It seems supporting this fact that Dock in Dock and Helwing (1999:60) explained that IRI could have powerful effects on attitudes

and behaviors of the learners. Besides, while describing the strengths of IRI as compared with television programs Dock conclude the following:

In a sense, the lack of visual presentation is one of the strengths of IRI- its absence encourages cognitive abstraction of concepts and their internalization. Thus, IRI is much more interactive than most television programs, and it is compatible with the constructivist learning theories. (Dock Helwig 1999:60).

Papua New Guinea launched IRI program with the aim to develop science lessons for grad 4,5 and 6. This is the first application of IRI to an open-ended inquiry - based curriculum (Tilson in Lockheed and Middleton, 1991: 337). As the same author distinguished such practice brings new challenges and requires new approaches because of two reasons. First, the radio lessons are designed for children in the upper primary grades. And it is likely that science teachers may experience difficulty, as the content becomes more complicated. In this regard, virtually all teachers in developed and developing countries cite science instruction as among the most difficult to accomplish. Second, radio science incorporates inquiry -based teaching; open ended questions, and the use of physical materials. Thus, in addition to radio broadcast, each lesson has a student worksheet and notes. Moreover, the instructional design of science radio lesson must accommodate content or questions for which there is more than one logical answer. Besides, a kit of simple materials and hand -on activities are still incorporated into the lesson (Ibid).

Evaluation results of different IRI projects confirmed that the use of inquiry - based teaching, open-ended question and physical materials are important to achieve significant learning gains through IRI. For example Leigh and cash reported the following:

... Key to success of Papua New Guinea's Radio science is support for inquiry. Course designers determined that the fast-paced responses of earlier interactive radio lessons would be inappropriate and that "the more reflective, open-ended questioning techniques used in adapting IRI for Science are critical to the subject matter. Costa Rica's radio dramas for environmental education, Let's Listen to the Earth, also employ "open questions to stimulate thinking. Similarly, South Africa's English In Action and my math's times promote activity based learning and open ended responses (Dock and Helwig 1999:33)

In general, the above point of discussions indicated that radio instruction is important since teachers and students continue to find satisfaction and value in its use. Moreover, evaluations results consistently have shown that radio instruction produce higher levels of learning.

2.6 Evaluation in educational broadcasting

Once the decision has been made to employ instructional radio, the program has two phases: the development phase and the sustained implementation phase (Dock and Helwig, 1999:8). The developmental phase involves planning, script writing, radio production, and piloting of the programs. During this phase, effectiveness of the program is tested, in terms of learning gains as well as teacher acceptance and support. The sustained implementation phase deals with the operationalization of the program in a substantial number of classrooms. As Dock and Helwig (1999) described, sustained implementation phase depends on commitment from governments, donor agencies, teachers, and students. After implementing radio instruction, it is necessary to make periodic evaluation of the program in order to assess effectiveness and obtain feedback from all participants.

Educators virtually agreed that evaluation is not an end of instruction. Because each phases of evaluation is the starting point for the next and continuing phases of instruction (Heinich and others, 1989:128). McAnany and Mayo (1980) also described

evaluation as an essential phase in educational radio projects with which program effectiveness can be measured. The reasons for doing evaluation will influence what will be focused on in the evaluation and the methods to be selected. Some of the more common reasons for doing an evaluation are listed below:

- See what has been achieved/accomplished (impact evaluation).
- Document what has been done and what progress has been made (process or implementation evaluation).
- Determine cost-benefit or accountability for expenditures.
- Share experiences/professional development.

(Source: Manual of SNNPR Education Bureau, 1997:76).

While stressing the importance of implementation evaluation, Dock, in Helwig Suggests: the following:

... The constituency needs to know how things are going-if, for example, children are indeed learning better than those not participating in an IRI Program; if teachers and school principals are satisfied; if teachers and children are doing what they are supposed to be doing in the IRI classroom; if the materials are still pertinent and in acceptable Condition. Soliciting feedback from participants and parents builds their sense of ownership and commitment to the program. With this perspective, evaluation, monitoring feedback, and research are clearly integral components of the drive for sustainability (1999,57).

In general a look at the above discussions indicates that evaluation is widely accepted as an essential component of educational radio broadcasting.

2.7 The Role of Radio in Education

For most countries, providing access and quality of education through the use of traditional methods is beyond the scope of foreseeable resources (Dock in Dock and Helwig, 1999:60). Due to this reason, Anzalone in Lockheed and Middleton (1991) reported that during the late sixties enormous numbers of children worldwide were not

enrolled in primary schools. He also noted that this situation was aggravated by the shortage of trained teachers, outdated curricula, and insufficient instructional materials. Unfortunately, however, there are numerous attempts that have been made to make use of educational media for extending and improving education at all level. For him, those that have been likely to be of interest for improving the quality of general education in developing countries include the following: textbooks; audiovisual supplements; instructional radio (both interactive and other radio instruction); and, instructional television. There are no doubt that such instructional materials having strength but in terms of availability, cost, and well-documented effectiveness, radio has an edge (Dock in Dock and Helwig, 1999:60).

Taking into account the broad categories of radio uses in education, Jamison and McAnany (1978) indicated that the uses of radio in education fall naturally into three broad categories; improving educational quality and relevance; lowering educational costs' and improving access to education.

2.7.1 Improving The Quality of Education

As enormously described in the professionals literature, one of the most important use of educational radio may be linked with the potential believed to exist in the medium to improve educational quality. Almost all past research studies on the medium including the local once uniformly ascertained this fact. To cite a few (Schramm, 1977:25-103; Jamison and McAnany, 1978:37-58; Hawkridge and Robinson, 1982:153-285; Sampath and others (1984:137-154; Tenkir, 1992; Teshome, 1998: 192-193).

In order to give a more concrete sense of the research findings, below is included, virtually unchanged, information from Forsythe and Jamison and McAnany as well as Teshome.

In summarizing studies of radios effectiveness Forsythe (1970) Concluded:

Research clearly indicates that radio is effective in instruction. Experimental studies comparing radio teaching with other means or media have found radio as effective as "Conventional methods," Even though radio have shown that Visual elements in learning are not uniformly important. In many educational situations visuals may be more harmful than helpful. Also, the efficiency of combined audio and visual media has been challenged by studies, which show that multi-channel communications may not inherently more effective than single-channel presentations. (Jamison and McAnany, 1978:30-31).

Like wise, Jamison, suppose, and Wells as cited in Jamison and McAnany (1978:31) concluded:

Radio has been used extensively for formal classroom instruction in the United States (more in the past than at present) and elsewhere. There exists, however, only a limited number of good evaluations of the effectiveness of instructional radio. These evaluations indicate that instructional radio (supplemented with appropriate printed material) can be used to teach most subjects as effectively as a live classroom instructor or ITV. Due to the limited number and scope of good evaluations now available, and to the potential economic significance of instructional radio for developing countries, much more research-both survey and experimental-is highly desirable.

Teshome (1998) concluded in a similar vein:

Finding clearly indicates that students are more promoted in subjects supported by radio in schools. Students assess their own learning from radio in a positive way in both regular and non-regular using schools. The majority of teachers in all schools have also confirmed that learning does take place from radio lessons. At the same time, the present findings consistently indicate that the degree to which teachers estimate student learning is higher in regular using schools than in non-regular using schools (Teshome, 1998:1992-193).

Therefore, based on the above discussion, it is possible to say that the potentialities of radio to enhance the quality cannot be held in low esteem.

2.7.2. Enlarging and Extending the School

Possibilities may exist to improve access in education when it is possible to teach more students utilizing radio as a medium without increasing the number of teachers and/or school buildings. This is so because of the spectacular nature of the medium to break away space and time limitations. Consequently, education may reach those disadvantaged groups. In connection to this, Jamison and McAnany (1978) mentioned that a final potential use for educational radio is to improve access to schooling for rural and urban disadvantaged groups. In much the same manner, Brown and others (1977) described that educational radio broadcasting is a useful means of providing learning experiences for large number of students. They also noted that radio has been an especially helpful resource for remote, isolated schools.

Thus, from the above lines of argument, we can conclude that radio should generally be the medium of choice to offer education for those disadvantaged groups.

2.7.3. Supplementing (Enriching) Instruction

In most of formal education systems, radio broadcast may provide a way to supplement the teacher. As Teshome (1998) realized radio's role as a supplement to education refers to those applications where the medium is used to improve quality by adding to regular school instruction in existing subjects. Like wise, Jamison and McAnany (1978) noted that the most widespread use of radio in formal education is for supplement in which case it will typically involve one or two 15 minute supplemental lessons per week, in different areas of the curriculum.

The above points imply that supplementing instruction is still the most common use of radio in education. Moreover, the above discussion indicated that almost all developing countries have been used radio to supplement the existing provision.

2.7.4. Direct Instruction

As indicated in the literature, radio becomes the medium through which direct provision of instruction is possible mostly for school age children and sometimes may be used for adult education. For example, Gough (1982) while discussing the functional role of radio in correspondence schools mentioned that the teacher broadcasts directly through the medium for students individually listening, with textbooks, assignments and written instruction (posted or delivered) forming the other learning media. Similarly, Jamison and McAnany (1978) reported that Australia, Germany, Great Britain, France, and Japan make extensive use of radio for distance learning. They also noted that the Dominican Republic has used radio plus correspondence to provide elementary level instruction to adults. In addition, they mentioned that the South Koreans are providing secondary school instruction through radio and correspondence.

Thus, as indicated above, in some instances, radio may take over the main teaching role if supported by the use of printed materials. And this shows quite clearly the most attractive use of radio in formal education.

2.8 Inputs of Educational Radio Broadcasting

Specific to educational radio broadcasting, inputs consist all the media, and materials for demonstration, manufacturing or creation, places, peoples, plus money and time (Gough, 1982:213).

2.8.1 Allocation of Resources.

Resources are crucial to meet a high standard of efficiency in technological operations, programming, utilization, decision-making, provision of services and manpower etc. Resources in educational radio broadcasting include all human, material financial and time factors.

Allocating qualified staffs for various activities largely determine the quality of the broadcasting program. When discussing about staffing of educational media operation, wells (1976), Zirker (1990), and Salah (1994) as cited in Teshome (1998) explain how the initiation of most projects depended on the use of foreign expertise due to the scarcity /absence of local personnel who could perform the type of operations required by educational broadcasting.

According to Jamison and McAnany (1978) there are two main areas of concern in financing educational broadcasting in developing nations. The first of these has to do with the strong efforts required in rising funds coupled with working out a sound political strategy for getting budgets approved in projects. The second aspect refers to the budget allocation strategy or how money is distributed for various activities of the project. In educational radio broadcasting some of the most common physical resources may include such components as production and transmission facilities, reception facilities, maintenance facilities, power resources and buildings. And Salah (1994) as cited in Teshome (1998) clearly indicated that these facilities are scarcely available or do not exist in developing countries. Thus, he suggested the need to take special consideration on this aspect.

2.8.2 Instructional development

Since radio syllabus is an important curricular material it should require certain main steps to be followed during development. Moreover, it requires some guiding principles in designing the radio programs. Gough (1982) suggested the following three main steps for developing the radio syllabus:

1. Defining the objectives precisely
2. Choosing the most effective techniques to achieve that objective.

3. Evaluating results in order to modify and improve the system

In addition to this, Locatis and Atkinson (1984) suggested general principles for designing radio instruction as well as principles for motivating and developing the learners' attitude. Below we have included virtually the unchanged version of what the authors have suggested:

General principles for designing instruction

- Introduce novel or unexpected events at the start of instruction
- Inform learners of expected outcomes
- Recall relevant prerequisite information
- Present only relevant information
- Organize content and present 'organizers'
- Progress from simple to complex
- Provide promotes and cues
- Vary information presented
- Present examples
- Provide appropriate practice
- Provide immediate feedback or knowledge of results
- Review and repeat

They also (1984) described the Principles for motivating and developing attitudes as follows:

- Tell learners that the subject of instructions is important
- Present reasons why the subject is important
- Arrange external rewards
- Ensure that learners experience success and accomplishment
- Pair subject matter with things that are attractive to learners.
- Introduce a discrepant, unexplained, or unfamiliar events
- Model interest and positive attitudes toward the subject.

2.8.3 Production, Transmission, and Scheduling Of Radio Programs

Educational radio deals with the production and transmission of radio programs which are intended to enrich and supplement formal and non-formal education (McQuil, 1989:32; Tenkir, 1992:5). Hence, programming in this category is for all practical purposes, restricted to stations operated by nonprofit educational institutions. Related to a formal curriculum the programme is transmitted to specific audiences in schools,

supervised by a teacher and usually supported by in-class materials, reading booklets and pictures, maps, charts, activities (Gough, 1982:240). It is actually team teaching demonstrations (Wittich and Schuller, 1979:158). This means the programs grow out of months of planning and consultation with local classroom teachers and other specialists. And this neatly depicts the combined efforts of supervisors, teachers, and subject-matter experts who work together to determine what learning experiences are best suited to radio lesson.

In fact, production of radio programs involves the process by which a well planned and written lesson is changed into instruction (USAID, 1988) as cited in (Teshome, 1998:24). To exist, a radio program must start with sound. Here, we shall discuss the process by which sound becomes a program. In order to be broadcast, Smith (1979) described that sound must be converted into a series of electrical pulses called an audio signal. It is the audio source that makes this conversation possible. He also described that a microphone and a telephone are both audio sources that convert line sound into audio signals. And a director tells the technician which audio signal or combination of signals to put on the line, that is, which to amplify and send to the next point on the way to broadcast. In addition, he pointed that a radio station chooses a target audience. In addition to this, the same author explained the fact that the format is often built around music that appeals to the target audience and host alternates.

After the program being prepared the next step is to arrange schedule time for the broadcast. In this case Farrant (1982) reported that this aspect is the major problem in developing countries. Supporting this idea Dock and Helwig (1999) identified scheduling conflict as one of the most severe problem in most educational radio projects.

2.8.4 Supporting Materials

Supporting materials for the radio lessons usually consists of radio lesson manual, teachers' guide, and students' materials. These materials are often prepared with active participation of local teachers considering students in mind. As Wittich and Schuller (1979) noted such materials describe the content of the programs, outline what students are expected to do, and list the materials that should be on hand when the broadcast begins. The same authors further mentioned that these materials are basically prepared and distributed before the broadcast. However, Hawkrigde and Robinson (1982) after reviewing a number of case studies summarized that all the case studies report either teachers' guides or workbooks for students as being an important part of the services they provide.

The above discussion generally implies the fact that supporting materials are vital areas of involvement by the broadcasting system. Thus, radio lesson manuals and teacher's guide for teachers together with activity sheets and reference materials for students should not be neglected in the development of radio curriculum.

2.8.5 In-Service Training

For curriculum implementation to be effective, relevant training for those who will implement the program, especially teachers, is very crucial. Teachers are here emphasized because they are the key to curriculum implementation. In view of this fact, Shiundu and Omulando (1992) stated that teachers need appropriate and relevant training to be able to handle a new program. With this connection, Locatis and Atkinson (1984) emphasizing the importance of in-service training about the radio use indicated the need of specialized training and equipment for planned local production of radio lessons. According to Hawkrigde and Robinson (1982) the Radio Mathematics project in

Nicaragua illustrates most clearly the précis function of training in the use of radio lessons. As the same authors briefly explained, at the start of the project, all teachers who were going to use the radio programs and students worksheets attended a three-hour workshop to ensure that they were technically competent in using the radio and the teachers' guides. They then received extensive guidance in the form of printed notes and suggestions; and they were also involved in the feedback to the project Team. They were, therefore, given the opportunity both to be and to feel involved in the project as a whole.

In short a look at the above points indicated the necessity of both initial and in-service training for effective implementation of radio programs. Thus it is quite appropriate to incorporate some training for teachers both in initial and in-service form.

2.9. The teachers' role in radio broadcasts

In the actual instruction, it is the responsibility of the teacher to provide a suitable environment for implementation. In view of this fact, Tyler (1949) described that a teacher has a leading and significant role to play in what and how to teach. As far as radio broadcasts are concerned, the classroom teacher is expected to establish conditions that make it probable that learning will occur within a reasonable period of time (Gerlach and Ely, 1971:48; Gough, 1982:215; Locates and Atkinson, 1984:12). In relation to this, Farrant (1984) neatly depicted the role of the teacher as follows:

1.Preparation before the broadcast: - this includes checking your radio to see that it is in satisfactory working order and that signals from the station you will be listening to are coming in loud and clear. It also means studying the written notes supplied by the broadcasting agency and any explanation or preparation that is necessary for the class before the broadcast begins.

2.Action during the broadcast: - usually the teacher's notes produced for the broadcast will draw attention to anything you may be called upon to do or show to the children. It is important that you should be ready at the

educational radio and television programmes are tied to print, which is the dominant medium in the University's teaching system. Moreover, NHK in Japan and the BBC in the United Kingdom have had some success in integrating print with their broadcasts in the formal sector.

The above point of discussions indicated that the use of other medias along with radio has a paramount importance in teaching. Thus utilizing other media like pictures and diagrams can be helpful.

2. 11. Factors affecting Formal Education Radio Program

2.11.1 External Constraints

Such constraints mostly consist of problems associated with a particular organization, which is responsible to produce and distribute broadcasts as well as supporting materials to the user schools. The first of this kind may be linked with organizational structure and decision-making authority. Jamison and McAnany (1978) while discussing with such constraints indicated that the need for careful planning and organization of radio strategies seems to be one of the great constraints on the success of implementation. Besides, the same authors indicated that location of decision-making authority would often dictate how radio will be organized. Similarly Hawkrigde and Robinson (1982) revealed that in educational broadcasting, institutional freedom largely reflects the location of decision-making authority with political and social traditions playing a greater role. Similarly, Teshome (1998) based on his experience confirmed that locating educational broadcasting in a ministry of education, having a transmission outlet and the capacity to decide on its transmission time facilitates the coordination between education and broadcasting, because it minimizes the constraints and priorities of national broadcasting. However, the same author further commented that

broadcasting would remain heavily dependent in the requirements of the ministry of education.

The second external constraint is lack of careful consideration in curriculum design and development. In fact, decisions concerning the types and total number of courses are the major activities in the development of educational radio curriculum. In order to accomplish these countries like Nicaragua, Republic of Korea, Mexico and Brazil attempted to create an elaborated partnership among media experts, curriculum experts, teachers, researchers and outside agencies. However, Hawkrigde and Robinson (1982) Commented that the proper blend of this experience is far from being achieved. In addition to this, Jamison and McAnany (1978) identified this constraint as the main reason for the radio use simply as a way of reaching more people and not as a part of a learning system. While elaborating this idea the same authors explained that account is often not taken of the difference between direct and mediated teaching, and the radio message is created as if the students were being addressed face to face.

The third area of external constraint includes production and distribution constraints. Gunter and Theroux (1977) as cited in Jamison and McAnany (1978) argue that the single greatest production constraint is the quality of radio programming. They also noted that educational programs are poorly made, dull and disinteresting, and therefore fail to attract a large group of audience. Having said this about production constraint, we will directly go to the discussion of transmission constraints.

In the past, research study findings mostly identified three areas of distribution constraints on radio projects. The universal problem almost all radio project facing is failure to make sure that printed materials arrive on time to be properly coordinated with the radio message. Set maintenance or replacement of batteries is another related

problem that many radio projects cannot control, and this most frequently occurs in the more isolated cases. Difficulties of signal strength often hinder good reception. Again, problems of this kind are often more acute for isolated populations.

2.11.2 Internal Constraints

The success of radio broadcast in schools depends on various internal factors. Some of the factors include: organizational structure and administration quality; availability and use of radio; classroom conditions; integrating with other media; and, personal conditions. Since considering these factors is often crucial to identify the strength and weakness of implementing radio broadcast, it is worth discussing them.

An institution such as the school is a bureaucratic organization. Hence, effective implementation of radio broadcast heavily relies on the quality of organizational structure and administration. In connection to this, Mohanty (1984) witnessed that the single most important factor for greater acceptance of radio in Jalagon project schools was the existence of an infrastructure and organized efforts of the project officials to look after various aspects of radio listening activity in schools. However, Sampath and others (1984), after analyzing the findings of a number of studies pointed the existence of weakness in implementing radio broadcast as a function of organizational factors. Furthering this idea, Locates and Atkinson (1984) reported that constraints on planning and management, administrative supports, supervision, and financial limitations as the most common problems in implementing radio broadcast. Therefore, as far as organizational structure and administrative quality is concerned, implementing radio broadcast would require the coordinated effort of people responsible in the field. Ranging from the school administrative bodies through supervisors to the teachers own

colleagues seems to have a share to give support in facilitating the implementation of radio broadcast of a given programs.

Availability and use of radio and classroom conditions appear to be the main potential factors identified in the literatures, which hinder or facilitate the success of implementation of radio broadcast in schools. For example, in relation to this, Brown and others described the following:

In the past, radio broadcasts for classroom use were handicapped by a number of difficulties. Schools found it troublesome or undesirable to use radio programs that came at the wrong time of the day or term. Departmentalized schools could not use broadcasts for all sections of a course without changing class schedules--- (Brown and others, 1977: 216).

In addition to this, a survey study conducted by All India Radio in 1992 revealed that problems of maintenance of radio sets; lack of technical equipment like microphone and amplifiers; and lack of suitable classroom atmosphere for concentrated listening e.g.' lack of space, very-crowded classrooms as a major difficulties in implementing radio broadcast in schools (Mohanty, 1984:140). Besides, at the 1990 African conference on radio Education in Harare, Zimbabwe a number of common problems were identified: variable quality of broadcasting equipment, maintenance and repair; and, insufficient radios, power (electricity and batteries); and repair services (curriculum Development Manual of SNNPR Education Bureau: 1997:65).

CHAPTER THREE

CONCEPTUAL FRAMEWORK AND METHODOLOGY

As mentioned earlier, this study was aimed at evaluating the implementation of science radio broadcasts in the primary schools of Addis Ababa as well as pointing out problems encountered in the implementation of science radio broadcasts. To fulfill this purpose, the approach followed was descriptive survey method. This method was selected since it is mainly appropriate to collect several kinds of data related with the problem under investigation.

In this chapter, we discuss the "nuts and bolts" of just how the study was accomplished. So, this chapter provides adequate information about. Conceptual model of the study, research design, subjects and sampling procedures, data collection procedures, issues concerning validity and reliability, and methods of data analysis.

Basic Assumptions

To have a clear picture about implementation evaluation of educational radio programme the researcher focuses on the following assumptions:

1. In principle, one of the most important rational for the use of radio in formal education has been the potential believed to exist in the medium to improve the effectiveness of teaching and learning.
2. Educational innovations like radio and television have a positive impact not only on learning itself, but also on student's overall motivation and attitude toward the school.
3. Of all the operational areas of educational broadcasting, it is the area of implementation that depends most on local conditions. Which means clearly it depends first on geographical Conditions of distances and

population density and on technological Conditions of power supply and transport.

4. There is no doubt that teacher guides and students' materials are vital area of involvement by the broadcasting system. As each system learns from its own experience, these materials become more important and effective in encouraging good use of the broadcast material.
5. For the betterment of educational radio program, it is likely important to involve audiences or user groups in methods of evaluation: if possible at both the formative and the summative stages. This clearly brings benefits both to the producers and to the users. To the producers it provides direct evidence of the response to their material from selected groups of the target audience. To the users it brings a genuine sense of involvement, a feeling that they have a creative part in the process.
6. Educational broadcasting may have several kinds of effects. It may affect individuals, whether teachers, students or parents of students. Or it may have effects on the structure or methods of educational or broadcasting institutions. Most of the time evaluators consider effects upon students; some also consider effects upon teachers.
7. Participation by all involved at various levels and stages in implementing school radio broadcasts must be brought into its planning, otherwise it will be received with suspicion or indifference.
8. One of the most frequent causes of collapse of otherwise promising strategies for change is the failure to provide adequate training for the

teachers and administrators or sufficient equipment and facilities for the new program.

3.1. Conceptual Model of the Study

In the foregoing chapter, we dealt with issues and concerns, addressed by educators, researchers, and professionals as they attempt to create settings and theoretical frameworks for conducting studies in the area of educational media in general and educational radio broadcasts in particular. Despite the fact that many studies have been made in these areas, Stewart (1985) revealed that literatures available on media studies failed to provide theoretical frameworks that can be used for other studies. In this regard, the present study is by no means out of this constraint. However, based on Kemp and other's (1968) model, CIPP model of Stufflebeam, and Teshome's (1998) model the researcher designed a conceptual framework that best suit to the nature of the study. Figure-3.1 shows the conceptual model of the study.

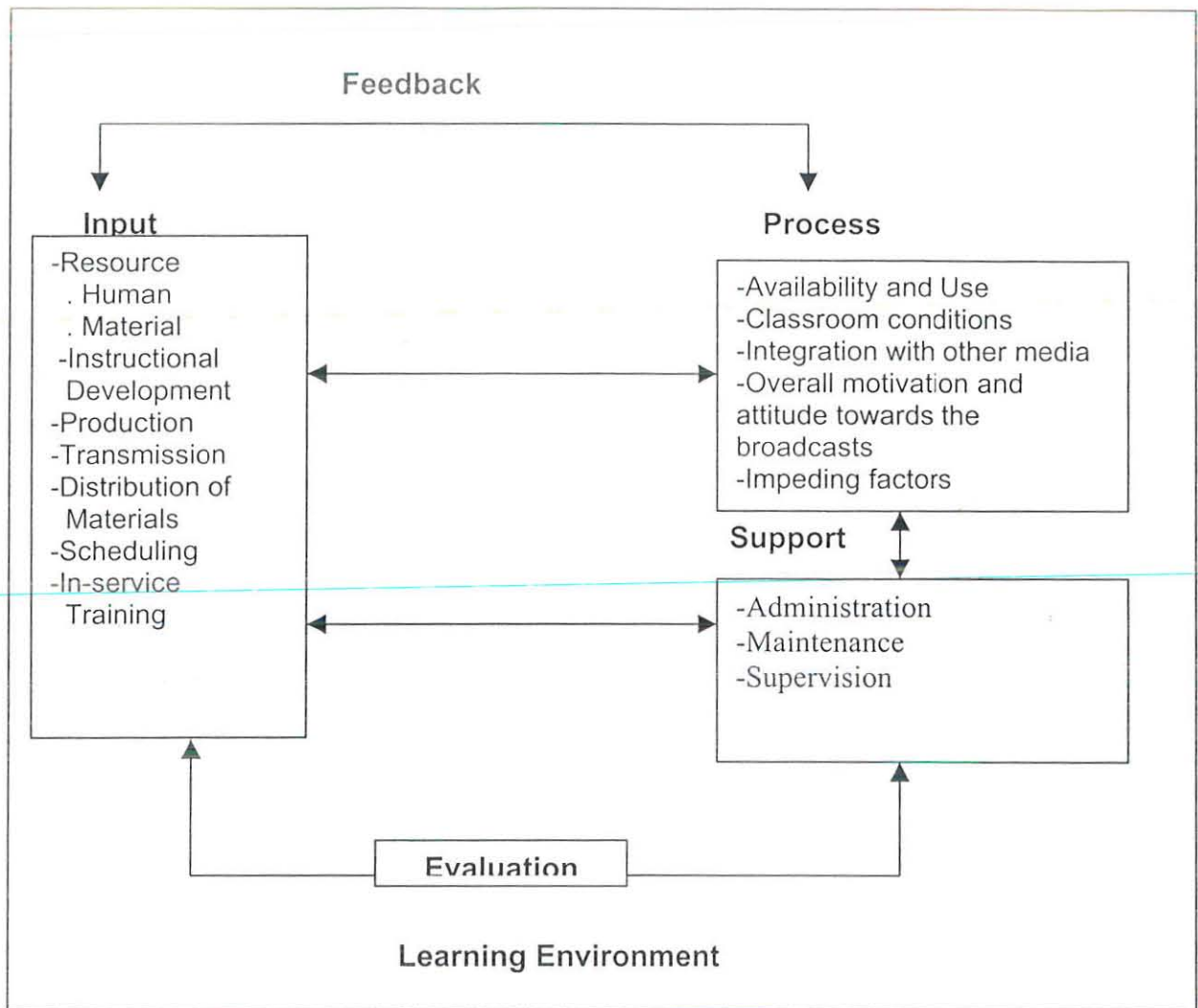


Figure 3.1 Conceptual Model of the study

As shown in the above figure, the horizon of this study comprises four areas upon which evaluation is going on. These are input, process, support, and feedback. Each area has two-way connections such that it determines as well as depends on others. Due to this reason, the data obtained from these areas was found quite essential to provide adequate information concerning the problem under investigation.

In this study, input refers to the necessary conditions existing prior to teaching and learning. Hence, consideration was given to resources, instructional development, production, transmission, and distribution of supporting materials, timetable, and

training. Process denotes the actual practice of implementation. So it focuses mainly on practical aspects, experiences, and interactions rather than theoretical speculations. In view of these points, due consideration was given to: availability and use, scheduling, classroom interaction, integration with other media, overall motivation and attitude towards Science radio broadcasts, and impeding factors. Support deals with activities such as; administration, maintenance and supervision whose importance mainly lies on strengthening the process. And feedback denotes exchange of information, which is primarily significant for the betterment of the whole areas

Participants of the study

To appreciate fully the reason why science radio has been implemented in the way that it has, the study focuses on identifying the main activities done at the planning and implementation stages. For this reason, individuals who are involved at various levels and stages participated to give information. Here the intention has been to allocate information rich sources of data.

In this study seven types of respondents involved to provide sufficient data: curriculum expert, media experts, REB Official, school directors and PC heads, teachers as well as students.

In the selection of IDCR experts, media experts, and REB official, due emphasis was given for the responsibility they hold in science radio broadcasting. The researcher believed that they could provide a rich inside view of the existing situation through interviews. The fact that they are relatively very few in number made it possible to include directors, PC heads and all science teachers in each school.

Student respondents were purposefully selected based on their experience with science radio broadcasts and their capacity to provide rich evaluative information about

the program (broadcasting). A testimony of this was proved with the data obtained during the pilot stage of the study. For more information on the participants of the study see table 3.2.

Table 3.2. Type and number of participants involved in the study

Type of participant	Number
Curriculum expert	1
Media expert	2
REB official	1
School director	6
School PC head	6
Teachers	18
Students	600
Total	634

3.2. Research Design

This section explains the design of the study in detail. It consists of description of the manner in which discussion was made about the type of data needed for the study, subjects and sampling procedures, data- collection procedures, methods of data analysis, and other procedures that are critical to the study.

This study followed both qualitative and quantitative research designs. In this regard, there are no hard and fast rules that are stated to use the one and reject the other or vice versa. Instead, prevailing trends favor the use of both designs in a single data. For example, Aronson and others (1990) described that each data collection

instrument has strengths and weaknesses. Regardless of this, the same authors suggested using each instrument accordingly as long as it is appropriate to the purpose, size, and situation under which the research is conducted. Similarly, Best and Khan (1986) stated the use of multiple data collection instruments as a rule, since each reveals different aspects of empirical reality.

For the qualitative data, determining sample size is entirely a matter of judgment. However, Patton as cited in Gall and others (1996) suggested that the selection of appropriate sample size involves a trade-off between breadth and depth. In view of this, the researcher employed manageable sample size considering the limited time and money without jeopardizing the breadth and depth of the study.

For the quantitative data the researcher employed sampling procedures and statistics, since these are exclusive domains of numerical data.

3.2.1. Subjects and Sampling Procedures

The Universe of the study includes all governmental primary schools in A. A. Except in the selection of male and female students where the researcher used cluster technique, simple random sampling was persistently employed throughout the selection of samples. In order to choose a handful of sample population a simple random sampling technique was employed. The basic feature of simple random sampling technique is that each and every element of the population has exactly the same probability of being selected. To this effect, Aronson and other (1990) pointed that simple random sampling is one of the most important tools for ruling out the danger of systematic error in sample selection. This sampling technique is commonly used in a large-scale surveys for a more comprehensive investigation, particularly when it is either difficult to compile an exhaustive list of the elements comprising the target population, or

when the target group to be covered becomes too large in number (Kohl, 1986; 97; and Gall and others, 1996: 233).

Having these in mind, according to the statistical information obtained from Region 14 Education Bureau, a total of 70 Governmental primary schools were functioning in the academic year of 2000. Within these schools a total of 25,195 students were enrolled in grade 5 and grade 6. Therefore, as the number denoting the target group is too large, the need to use simple random sampling technique was apparently important.

As a result, among 6 zones of Region 14, two zones (i.e., zone 2 and zone 4) were randomly selected. By using same technique, three woredas were selected from each zone (i.e., woreda 20, 21, and 24 from zone 2 and woreda 1, 11, and 12 from zone 4). Still employing same technique, one school was selected from each woreda (i.e., Worha Yekatit from woreda 20, Edget Behibret from woreda 21, Keranio from woreda 24, Timihirt Bilichita from woreda 1, Entoto Amba from woreda 11, and Hibret Firie from woreda 12).

From each school, an equal proportion (i.e. 100 students) was taken of which equal numbers being given to each grade level (i.e., 50 for grade 5 and 50 for grade 6). Using cluster sampling technique, from each grade level, 25 females and 25 males were chosen. Thus, a total of 600 students were considered.

3.2.2 Data Collection Procedures

This section focuses on describing data collection instruments, the variables it is designed to measure, the validity and reliability of the scores that it yields, and the steps that the researcher followed in administering it.

To obtain adequate information for the study the following four types of data collection tools were employed: 1. Questionnaire, 2. Classroom observation, 3. Content analysis, and 4. Interview

1. Questionnaire

Two sets of questionnaires, prepared in Amharic, were used to obtain information from students and science teachers of the targeted grades (see Appendix 1 and 2 for the English version of the two questionnaires).

The student's questionnaire has got three parts. The first part was prepared to get information about the student's personal data (i.e., zone, school name, age, sex, and grade level).

The second part was prepared in the form of a rating scale. The rating scale is designed to measure the student's attitudes towards the broadcasts. For this reason, Likert scale was employed for two reasons. One, it provides respondents a variety of specific categories from which they can select. Two it allows subjects to prefer to answer anonymously when they are asked to rate their expressed opinion. The Likert scale consisted of specific categories of expressed opinion represented by number: 1 = strongly disagree; 2 = disagree; 3 = undecided; 4 = agree; and; 5 = strongly agree. Thus each student has a score from 1 to 5 on each item, and a student's total score, representative of an overall attitude, is simply the sum of the item scores. At the preliminary stage two science curriculum experts assessed the instrument in order to maintain validity. After administering the scale to the preliminary sample, the researcher then examined each item to see how well it discriminates between the students with the most favorable attitudes (top 25 percent) and those with the least favorable attitudes (bottom 25 percent). Those opinion statements, upon which both the high scorers and

the low scorers responded in the same way, have been discarded, on the assumption that they did not measure the same attitude as the scale as a whole.

Based on these, out of 15 items of opinion statements designed during the pilot stage, three of them were discarded. Thus, the final scale (i.e., 12 opinion statements) was constructed from the items that consistently elicit agreement from the most favorable pilot study subjects and vice versa.

The third part of the questionnaire was prepared to obtain information about the type of student activities and the extent of their involvement in experimenting and/or practicing. Moreover, this part was designed to collect adequate data on impeding factors that hinder effective implementation of science radio broadcasts. With this perspective, then, the questions addressed to: the presence or absence of certain student activities, the frequency of occurrence of experimenting and /or practicing during the broadcasts, a set of possible comments, and list down those possible factors that affect implementation of science radio broadcasts.

The draft questionnaire was first administered to students of two primary schools (i.e., Temenja Yazj and Sibistie Negasy) selected for the pilot study try-out in zone three. From each school, an equal proportion (i.e., 20 students) was taken of which equal numbers being given to each grade level (i.e., 10 students). From each grade level, 5 females and 5 males were chosen using cluster sampling technique. Thus, a total of 40 students were participated to fill in the questionnaire during the pilot stage. After being filled by the students, each and every question was examined item-by-item to detect ambiguous and unclear statements. Especially, on the attitude measurement scale a sort of quantification was made to measure the internal consistency of each statement. By correlating each item average score with the overall score average, a correlation

coefficient of + 0.43 - 0.55 was obtained for those items employed in the final scale. As Likert (1967) stated, the size of correlation coefficient required depends upon the purpose for which the expressed options are being measured. In view of this point, the same author further noted that in a general survey type of study the correlation coefficient required would be around 0.50 that shows moderate agreement. To this effect, the correlation coefficient obtained for the final scale during the pilot stage appears to be a good indicator of the internal consistency for the opinion statements. Regardless of these, in the rest of the questions, except some minor modifications, it was found to be useful for the intended purpose. Finally, the questionnaire has been administered to the actual respondents by the researcher along with assistant data collectors.

The teacher's questionnaire consists of five parts. The first part deals with personal information of the teachers. The second part was prepared to get information on: the availability of radio sets and science radio teachers guide, radio function and frequency of use, the existence or absence of broadcasting schedule before the program starts and it's suitability with the school time table. In addition this part was aimed at obtaining information about the major implementation problems faced during the broadcast and suggested solutions.

In view of these, then, the questions addressed to: the adequacy or inadequacy of radio sets and science radio teachers guide, frequency of use and the extent of radio functions, the arrival of scheduling time table before the broadcasts and it's suitability to the school time table and list down the factors which influenced the implementation of science radio broadcasts.

The third part was prepared in the form of rating scale. The rating scale was prepared to measure teacher's attitudes towards the broadcasts. To this effect Likert was selected and utilized for two reasons. One, it provides respondents a variety of specific categories from which they can choose. Two, it allows them to prefer to answer anonymously when they are asked to rate their expressed opinion.

The Likert scale contains specific categories 1 = strongly disagree, 2 = agree; 3 Undecided; 4 = agree, and, 5 = strongly disagree. Hence, each teacher has a score from 1 to 5 on each item, and a teacher's total score, representative of an overall attitude, is simply the sum of the item scores. After administering the scale to the preliminary sample, the researcher then examined each item to see how well it discriminates between the teachers with the most favorable attitudes (top 25 percent) and those with the least favorable attitudes (bottom 25 percent). Those opinion statements, upon which both the high scorers and the low scorers responded in the same way, have been discarded, on the assumption that they did not measure the same attitude as the scale as a whole. In addition, the researcher examined the internal consistency of the measure by Checking to see how well they correlate with the overall score. Items that are not correlated with the overall score average were then eliminated, since they are likely to contribute disproportionate amount of error variance and to lower the overall significant of the results.

The fourth part of the questionnaire was designed to get information about teacher's training (both preliminary and in -service), administrative support, maintenance Service, and supervisory activities. With this intention, then, the questions addressed to the extent of teachers' participation in training of which the courses include implementation of radio broadcasts, the adequacy or inadequacy of maintenance

services, frequency of supervision made while implementing science radio broadcasts in a school. Based on these, only one item of opinion statement designed during the pilot stage was discarded. Except this, all the items consistently elicit agreement from the most favorable pilot study subjects and vice versa. Thus, the final scale (i.e., 12 opinion statements) was constructed from these items.

The fifth part of the questionnaire was prepared in order to obtain information about teacher's comment on the program organization and content as well as presentation of broadcasters. Besides, it was aimed at obtaining information about the teacher's general comment on science radio broadcasts. With this perspective, then, the question addressed to: the frequency of teachers participation on planning and development, the existence or absence of content clarity and sequence of presentation, adequacy or inadequacy of response time given for the students, appropriateness or inappropriateness of the program to the students age level, whether it was relevant or irrelevant to teaching and list down his/her general comment on science radio broadcasts.

In two primary school (i.e., Temenja Yazj and Sibistie Negasy) selected for the try-out in zone three, the draft questionnaire was first distributed to science teachers of grade 5 and grade 6. All science teachers (i.e., six teachers) of the two primary schools filled in the questionnaire. After being filled, each and every question was examined item-by-item to detect ambiguous and unclear statements. Particularly, on the attitude measurement scale quantification was made to examine the internal consistency of each statement. By correlating each item average score with the overall score average a correlation coefficient of + 0.45- + 0.60 was obtained for those items of opinion statements employed in the final scale. This indicated that the internal consistency of the

opinion statements was satisfactory. Based on the results of correlation coefficient few items were discarded during the pilot stage. In the rest of the questions, except some minor modifications, it was found to be appropriate for the intended purpose. Finally, the questionnaire has been distributed to science teachers of grade 5 and grade 6 in the targeted schools. As a result, virtually all teachers (i.e., 18 teachers) filled in the questionnaire during the major data collection stage.

2. Classroom observation

In order to assess the actual implementation of science radio broadcasts, an observation was made by using classroom observation rating form (see Appendix 3 for the rating form). The rating form was prepared to measure instructional considerations such as: learning condition, teaching behavior, Student activities, and the use of visuals. These instructional considerations were identified based on the review of literature on media studies.

During the pilot stage, in try out schools, the rating form was pre-tested in six classrooms for reasons of improving validity and reliability. To this effect, two observers were used. On the bases of the two sets of observations, a correlation coefficient of ($r = 0.84$) was used as an index of inter-observer reliability of the variable measures. For the majority of the variables, high inter-observer reliability was obtained since the measures were straightforward and clear. However, for some of the items where the observers showed low reliability due to abstract and ill-defined categories, the variables were modified to the one that is more concrete and easier to measure. And then retested in the next observation. Through this, items, which were found to be too general, were refined for final use.

3. Content Analysis

With the help of content analysis rating form, science radio teacher's guide of grade 5 and grade 6 were analyzed (see Appendix 4 for the rating form). The rating form was prepared to measure the existence or absence of categories such as: stated objectives, sequence of content presentation, demonstration, discussion question, practical activity, example, science kit and lab apparatus, open ended question, and reference books.

In the preliminary stage two coders for the purpose of improving validity and reliability pre-tested the rating form. In view of this, the correlation of the total scores based on the two sets of coding ($r = 0.86$) was used as an index of inter-coder reliability of the variable measures. Similarly, adding new categories and checking to see how well they correlate with the overall categories improved internal consistency of the categories. To this effect, categories that were not correlated with the overall categories were then eliminated, in order to avoid error variance and lower significance of overall results. Through this, those categories with low correlation were refined for the final rating form.

During the major data collection stage, 50% of the radio programs in the teachers guide (i.e., 14 for each grade level) were used. Hence, a total of 28 randomly selected programs were strictly analyzed. See Appendix 9 for the sampled radio programs of the teacher guides.

4) Interview

In an attempt to collect data directly from Media and curriculum experts as well as school directors and PC Heads two sets of unstructured interview guides were prepared

(see Appendix 5 and 6 for the interview guides). The interview guides were mainly focused on issues and concerns of the support service provided for the teachers in facilitating implementation of science radio broadcasts, the major constraints faced while planning and implementing, the possible measures taken to overcome the problems, and information exchange among: the user schools, EMMA, ICDR, and REB. All the information obtained using interview was used to substantiate the teachers' and students' responses.

3.3 Methods of Data Analysis

Depending on the nature of the collected data, different statistical techniques were employed. For the close - ended questionnaire items upon which teachers and/or students were required to choose among the given alternatives, the value was first tallied within the respective category. Then after, to summarize the data obtained, simple frequency counts and percentages were used. Percentages were used mainly to make the figure easily understandable.

For the open - ended questionnaire items in which teachers and/or students were asked either to list down or comment on, a special answer codes were prepared. The response of each individual was coded accordingly. After that the data obtained was quantified into simple frequency counts and percentage.

In the attitude measurement scale, each response has five specific categories (i.e., 5 = strongly agree, 4 = agree, 3 = undecided, 2 = disagree, and 1 = strongly disagree). Thus, an individual score was determined by the sum of the point values given for each statement. After that the scores were categorized into high and low using a median test. For the teachers' responses, first the attitude score of each teacher was summed and then the median score was calculated. After that the score of each

teacher was compared with the median. If the particular score is above median, the observation is assigned to the "above median" category. If it is below median, the observation is assigned to the "below median" category. Through this, the data was arranged into a two by one table followed by the computation of the chi-square statistical test to show whether there is a significance difference or not between the above median and below median proportions, with alpha (α) 0.05 level of significance. Scores failing above the median would indicate a positive attitude towards science radio broadcasts and vice versa.

For the students' response concerning attitude, the first step was summing the point values given for each statement. After that the scores were categorized into high and low using a median test. In computing the median test, which is a special application of the chi-square (χ^2) test of association, first the student respondents were grouped into two based on their grade level. The attitude score of each student was listed under the group he or she belongs. Then the scores of the two groups were combined into a single distribution and the grand median was calculated. Next, the score in each group was compared with the grand median. If the particular score is above the grand median, the observation is assigned to the "above median" category. If it is below the grand median, the observation is assigned to the "below median" category. Through this, the data were arranged into a two by two table followed by the computation of the chi-square- (χ^2) statistical test to show whether there is a significance difference or not between the above median and below median proportions in the two groups, with alpha (α) 0.05 level of significance. Scores failing above the median would indicate a positive attitude towards science radio broadcasts and vice versa.

The collected data using observations were assembled on the basis of the items in the observation rating form. The rating form was prepared with a three-point scale (i.e., yes somehow, and no) to indicate the degree to which instructional consideration was happened. The values given for each teacher during the three observation sessions were tallied into one of the three scales. To summarize the data obtained using content analysis, simple frequency counts and percentages were used.

CHAPTER FOUR

FINDINGS AND DISCUSSION

In this chapter the data collected using instruments (i.e., questionnaires, classroom observation, content analysis, and interview) are presented with the help of table and then followed by interpretation and discussion of the results to respond the basic questions set in the study.

4.1. Findings of the study

4.1.1. Teachers involvement in pre-service training

One the basic problem that influences effective implementation is the failure to provide adequate training for the teachers. When we think of teachers' training, we should think in terms of pre-service and in-service.

To ensure whether or not science teachers are capable of meeting the demand placed on them, an item in a questionnaire asked teachers about their participation in pre-service training. For those who said I have participated, another question was followed about their involvement in courses on how to implement radio broadcasts. Table 4. 3. Presents the summary result for the first item. Following the table the result of the second item is described in a statement form.

Table 4.3 Frequency and percentage distribution of teachers' participation in teacher training programs.

Categories	Frequency	Percentage
Participated	10	56
Not Participated	8	44
Total	18	100

The participation of teachers in teacher training programs is an indicator of effective instruction in classroom teaching. Accordingly, as it is shown in the above table, 10 (56%) of the respondents participated in teacher training programs. However, 8 (44%) of them have not participated.

Among those who participated, 5 (50%) of them took courses on implementation of radio broadcasts; whereas, 5(50%) of them did not.

From these points, it is quite understandable that a little bit less than 50% of the teachers instruct science radio broadcasts without taking teacher-training courses. Moreover, even from those who took teacher-training programs, 50% of them instruct without taking courses on how to implement science radio broadcasts. Therefore, it should be borne in mind that the importance of teacher training is highly neglected in the case of assigning science teachers for grade 5 and grade 6. In addition to this, though educational radio broadcasts are implemented in the primary schools, their application in science subject is not in line with the programs of teacher training.

4.1.2. Teachers involvement in in-service training and instructional development

An item in a questionnaire asked teachers how often they have been participated in the in- service training and instructional development programs for the last three years (1998 -2001). Four alternatives were given (i.e., never, once, twice, and three times). Teachers were asked to put a mark with tick (✓) one of the alternatives that best suits their answers. The obtained result is summarized in table below (table 4. 4).

Table 4.4. Frequency and percentage distribution of teachers by participation in - service training and instructional development of science radio broadcasts.

Extent of Participation	Type of Participation	
	In-service training	Instructional Development
Never	16 (88%)	16 (88 %)
Once	2 (12%)	-
Twice	-	1 (6%)
Three times	-	1 (6%)
Total	18 (100%)	18 (100%)

In order to implement instruction effectively, it is important to use the virtues of teachers’ participation in in-service training coupled with this adequate participation of teachers in planning and development of radio broadcasts should not be undermined. Especially, if most of the teachers have no preliminary training, the need to employee in-service training becomes paramount importance. Regardless of this fact, the data presented in table 4.4 indicated that the participation of teachers in in-service training is ill -considered in the sampled zones. From 18(100%) teachers, 16 (88%) of them have never been participated since 1998 and 2 (11%) of them have participated only once since then. On the basis of this information, there is no doubt that participation in-service training is highly ignored. Together with this, as it is depicted in the same table, the participation of teachers in instructional development is also ill considered. In this regard, from 18 (100%) teachers, 16 (88%) of them have never been participated since 1998 where as 1 (6 %) of them have been participated twice and another 1 (6%) three

times. Hence, it is clear that the participation of teachers in instructional development is also highly ignored.

With regard to in-service training, the results of interview also confirmed, as it is a rare occurrence. Because, except the directors and PC heads of school A and F where they have been participated in in-service training of science radio, the directors and PC heads of school B, C, E, and F responded as they have never been involved. Besides, media experts and REB official also strengthen this fact that limited number of participants have been participated each year due to financial constraints to arrange in-service programs for large number of user schools. Coupled with this, virtually all the directors and PC heads responded, as they have never been involved in the process of instructional development. Though they have failed to reason out, media experts and REB officials asserted the fact that limited number of teachers have been involved in content selection only. On top of these, the expert in ICDR informed, as he has never been involved in in-service training and instructional development programs.

Generally, the above lines of argument indicated that the participation of school directors, Pc heads and curriculum experts in in-service and instructional development of science radio broadcasts is undermined or forgotten.

Furthering the context of instructional development, media experts were asked about the problems faced during the development stage of the radio programs. One of the experts described that financial shortage, inability to find volunteer participant students and adults and lack of transportation for the participants as a problem. Similarly, the other expert stated that lack of administrative support, transportation, and skilled personnel for production and transmission of broadcasts were the problem.

4.1.3. Quality and appropriateness of the program Content and presentation

Teachers were asked whether they agree or disagree on statements that deal with quality and appropriateness of the program content and presentation. While three of the items describe the possible benefits for the teachers, three of the other items deal with the possible values for the students. Table 4.5. Illustrates the summary result. In addition to these four items in the observation checklist used to assess the quality and appropriateness. In this case measurement mainly focuses on media principles only.

Table 4.5. Frequency and percentage distribution of teachers' responses on the quality and appropriateness of the program content and presentation of science radiobroadcasts.

	Categories	Teachers Responses		Total
		Yes	No	
1	Present accurate and well-organized content in an engaging manner.	17(94%)	1(6%)	18(100%)
2	Provide clear guidance to the classroom teacher.	16(88%)	2(12%)	18(100%)
3	Provide clear and straight forward instructions	17(94%)	1(6%)	18 (100%)
4	Provide good teaching techniques from which teachers can learn	14(78%)	4(22%)	18(100%)
5	Incorporate response pauses that are neither too long nor too short.	16(88%)	2(11%)	18(100%)
6	Suitable to the age level and interests of the students.	14(78%)	4(22%)	18(100%)

As it is indicated in table 4.5, presenting accurate and well-organized content and providing clear and straightforward instructions were equally considered by 17(94%) respondents. In much the same manner, providing clear guidance to the classroom teacher and incorporating sufficient response pauses were considered by 16(88%)

respondents. Along with this, providing teaching techniques and suitability to the age level and interests of the students were considered by 14 (78%) respondents.

From the table above, it is clear that the proportion of teachers who said yes for each category by far exceeds the proportion that said no. While the frequency of teachers agreement to each category is between 14 -17, the frequency of teachers disagreement is between 1-4. On the average 15 -16 teachers agreed on each category. Based on this, it is possible to say that the quality and appropriateness of the program content and presentation is highly accepted by teachers.

Along with this, Science radio teacher guides of the targeted grade levels were analyzed. The existence or absence of eight categories was checked with the intention to evaluate the significance of each guide. The categories are partly adopted from Amare (1998) and Tesfaye (1990) and partly coined by the researcher. In this case, the researcher believed that the categories are relevant to evaluate each teacher's guide from two perspectives. One, from the context of basic requirements for curricular materials. Two, from the contexts of fulfilling the principles of teaching strategy for science.

Those categories observed 9-14 times were taken as they present abundantly. Similarly, categories observed 3-8 times were taken as they present rarely .On the contrary; those below three times were taken, as they do not exist. Table 4.6 presents the result of each grade level teacher's guide.

Table 4.6 Ratings on the assessment results of content analysis in the teacher's guide of science radio by grade level.

N	Categories	Extent of presence in science radio by grade level.					
		Grade 5			Grade 6		
		Abundantly	Rarely	Not at all	Abundantly	Rarely	Not at all
1	Stated objectives	14(100%)			14(100%)		
2	Discussions questions	14(100%)				3(21%)	
3	Practical activities		3(21%)			3(21%)	
4	Examples	9(64%)			14(100%)		
5	Suggestions to use science kits and laboratory apparatus			0(0%)			0(0%)
6	Suggestions to use visuals such as pictures and diagrams		4(28%)			5(36%)	
7	Open ended evaluative questions			0(0%)			0(0%)
8	Reference			0(0%)			0(0%)

* No of randomly sampled programs = 14 (for each grade level)

Key

- Abundantly - (9- 14) (64 -100%)
- Rarely - (3-8) (21 -44%)
- Note at all - (0 -2) (0 -14%)

A critical observation in the above table indicates that categories such as: Stated objectives, discussion questions, and examples are abundantly present in science radio teacher's guide of grade five. In addition, practical activities and suggestions to use visuals (i.e., picture and diagram) rarely present in the same teacher's guide.

Similarly, a critical observation in the same table indicates that stated objectives and example's are abundantly present in the science radio teacher's guide of grade six. Besides, discussion question, practical activities, and suggestions to use visuals such as: pictures and diagrams are rarely present in the same guide. Along with this, suggestions to use science kits and laboratory apparatus, open-ended evaluative question, and references are totally absent in the same teacher's guide.

In its real sense, the teaching of science requires equal considerations being given for theoretical and practical aspects. To this effect, teacher's guide for science must be prepared to help the teacher by suggesting ways and means of instructing theoretical and practical classes. With this view in mind, science radio teacher's guide is expected to accommodate those categories stated in table 4.6 as abundantly as possible. For this reason, those categories that are Present more than seven times abundantly present in science radio teacher's guide of grade 5 and 6 indicate strength on the part of the material. On the contrary, those categories that are rarely present below seven times indicate the weakness of the material.

Hence, the results in table 4.6 indicate the presence of stated objectives and examples in both teacher guides. Besides, the presences of discussion question in the teacher's guide of grade six. Along with this suggestions to use science kits, open-ended evaluative questions and references totally absent in both teacher guides. Based on this, it should be noted that the teacher guides have some failure in order to fulfill its purpose.

In line with this, while conducting classroom observation, the researcher identified the existence of four components that ensure quality and appropriateness of science radio broadcasts. One, in each attended programs, the broadcaster use repetition of

main concepts. Two, each broadcast begins and end in a standard way. Three, the broadcaster use relaxation segments to break the intense concentration listening requires. And four, in each broadcast, the broadcaster uses a variety of presentation formats (i.e., explanation, discussion, interview, dialogue, and questioning and answering). In support of this fact, the media expert in EMMA asserts:

The programs are designed to provide teaching and learning benefits. For the teacher it saves time and energy since the producers have made available references at the time of instructional development. So, it helps the teacher sharing the load of his teaching task. For the students it gives a refined knowledge appropriate to their ability and age level due to three reasons. One, the programs consist of various formats. Two, the contents have up-dated information of science that may not be found in the student's textbook. Three, the presentation mode will help the student to create real imaginations of various concrete experiences that the print (the text book) cannot provide.

In connection to this, the REB official informed as he has been participated to give comment on the quality and appropriateness of the program content and presentation during the planning and development stage. However, the curriculum expert in ICDR informed, as he has not involved giving comment both during planning and implementation stages.

Regardless of this fact, teachers and students responded that the present number of science radio broadcasts is inadequate. In light of improving the number of broadcasts, 471 (79%) of the student respondents as well as 16 (88%) of teacher respondents informed the inadequacy of the present number of science radio broadcasts. Also, this can be an indicator of the quality and appropriateness of science radio broadcasts.

In view of the above points, it is important to remember that the program content and presentation of science radio broadcasts may have contributions both for teaching and learning.

After a consensus has been reached as to what will be included in to the contents of radio programs, the next step is implementing the program as it is intended. At this stage quantitative expansion will be determined on the availability and function of instructional resources. Since they are vital in implementing radio broad casts, emphasis was given for the availability of radio sets and teacher guides. Besides the extent of radio function in the school was due considered. The next two-consecutive tables (i.e. table 4.7 and table 2.8) will present the summary result obtained from the teacher respondents.

4.1.4. Availability of instructional resources in schools

Teachers were asked on the adequacy of radio sects and science radio teacher guides in their respective school. The alternative answers given were adequate or inadequate. A summary of the result is presented in table 4.7.

Table 4.7 Frequency and percentage distribution of teachers’ responses on the adequacy of radio sets and science radio teacher’s guide in schools.

Teachers Responses	Types of instructional resources	
	Radio Sets	Science radio Teacher’s guide
Adequate	5(28%)	7(39%)
Inadequate	13(72%)	11(61%)
Total	18(100%)	18(100%)

As shown in the above table, (28%) of the teacher respondents said that radio sets are adequate. Similarly, 7(39%) of the respondents said that science radio teacher guides are adequate. On the contrary while 13 (72%) of the teacher respondents said radio sets are inadequate, 11 (61%) of the respondents said science radio teacher's guide are inadequate. From this data, one can easily understand that more than half of the respondents answer is inadequate for the availability of the stated instructional resources.

Those who responded that the radio sets are inadequate further described that the no of radio sets are not proportional as compared to the number of students who attended in one broadcast time. In a similar vein, those who responded the no of teacher guides are not adequate further described that the no of radio teacher guides are not proportional as compared to the number of science teachers in the school. In both cases there response indicate incompatibility of the materials with the users.

In line with this, in some of the observed classrooms one radio was used for students of two or three classes, which comprises a total of around 200 students in one broadcast time. Besides, some teachers were observed using a hand written teacher's guide of their own due to a complete absence of it in the school. Instances of the truth of this have been proved in school B and E.

With this connection, the interview result of school directors and Pc heads revealed that radio sets and radio teacher guides are inadequate in most of the schools. Because except the directors and Pc heads of school A and C, the others (i.e., in school B, D, E and F) said inadequate. Those who said adequate further informed that they have been using cassettes to give chances of attending broadcasts for missed programs

as well as beyond the schedule time so that teachers can borrow and arrange programs with the students. Those who said inadequate gave reasons that they have financial constraints to purchase additional radio sets. Besides this, the radio teacher guides are inadequate because only one or two teacher guides were supplied for them. .

Therefore, it is important to remember that the no of radio sets as well as the no of science radio teacher's guide are inadequate in the sampled schools. As a result, inadequacy of these instructional resources may adversely affect implementation of science radio broadcasts in the schools.

4.1.5. Radio function in the Schools

An item on a teacher's questionnaire asked teachers to rate the extent of radio function in their schools. The item presented a four point scale measurement ranging from never to always. The results indicate that large majority of teachers rated as the radios' functioning always and a small minority rate as functioning sometimes. The other extents (i.e., never and occasionally) were not expressed by the teacher respondents. Table 4.8. Depicts the summary results by collapsing the responses into two categories.

Table 4.8. Frequency and percentage distribution of teachers’ responses on the extent of radio functions in the schools.

Extent of radio Function	Teacher respondents	
	Frequency	Percentage
Sometimes	2	12%
Always	16	88%
Total	18	100%

In table 4.8, the frequency and percentage distribution of teacher respondents on the extent of radios function indicated as functioning either sometimes or always. Accordingly, 2 (12%) of them rated as it is sometimes and 16(88%) of them rated as it is always.

In connection to this, virtually all the teacher respondents informed as they use science radiobroadcasts regularly. Nevertheless, while using radios all of them faced with four problems in common. One, occasional absence of broadcast from the center. Two, Unexpected light interruption. Three, limited no of broadcast time that enforced teachers merging students of 2 or 3 classes in one broadcast time. Four, poor sound quality. Similarly, students' respondents also pointed these four problems as the major implementation constraints. In addition to this, Poor sound quality identified during observation, especially during afternoon broadcasts provided a further clue.

With regard to solutions for these problems, the data collected through interviewing school directors and PC heads revealed as some of them make use of batteries, cassettes and wide classrooms. Unfortunately, however, in the classroom observations made on 11/07/93 and 18/07/93 light interruption and a complete absence of broadcast happened respectively. In both cases, the classroom teachers instruct the lesson substituting the radio teacher.

Regardless of the fact that the situation in the observed classrooms indicate contrary to what has been said by some of the school directors and PC heads, it should be borne in mind that all the measures raised by the school directors and the measures taken by classroom teachers can be helpful to overcome problems while implementing radio broadcasts in schools.

Among the various pressure groups, which influence effectiveness of radio broadcasts, support services are perhaps one of the most influential. In this paper support could mean three things (i.e., administration, maintenance, and supervision) whose major role is enhancing program effectiveness. In the next few pages, how they have been treated in the study along with a summary result and interpretations will be presented. While table 4.9. Illustrates the summary results of the extent of administrative and maintenance support, table 4.10. depicts the number of supervision that has been made in schools.

4.1.6. Administrative and maintenance Support

Teachers were asked through questionnaire to measure the extent of administrative and maintenance provision in their respective schools. The alternative answers were three (i.e., low medium, and high). Table 4.9 presents the summary result of the teachers' responses

Table 4.9. Frequency and percentage distribution of the extent of provision by support type.

Extent of Provision	Types of support	
	Administrative	Maintenance
Low	6 (37%)	16(89%)
Medium	6 (37%)	2 (11%)
High	4 (26%)	-
Total	16(100%)	18 (100)

As it is indicated in the above table, out of a total of 16(100%) teacher respondents, 6(37%) of them rated low provision of administrative support in the school. While 6 (37%) of the respondents rated medium provision, 4(26%) of them rated high provision of administrative support. from this, one can understand the existence of three types of administrative services in the primary schools.

Along with this, those who rated for this item low provision of administrative support further explained that administrators, particularly directors in their respective school did not pay attention for implementation of science radio broadcasts. They also pointed out that the administrators did not give considerations for implementation problems to which science teachers informed. Some of the problems include scheduling conflict, inadequacy of classroom space to accommodate students of two or three classes, and absence of sockets in the classrooms. To this effect, it is important to remember that in some of the sampled schools provision of administrative support do not exceed beyond assigning science teachers for different grade levels in which case provision of support is a nominal one.

As it is indicated in the same table, out of 18 (100%) respondents, 16(88%) of them rated provision of low maintenance service in their respective schools. However, 2(12%) of them rated medium. As the number denoting low provision of maintenance service expresses a high majority, there is no doubt that in schools radio maintenance is a forgotten element. With the intention to obtain data about the extent of administrative and maintenance provisions in schools, directors and Pc heads were interviewed, Virtually all of them described as they have emphasis to give administrative support. For instance, directors and Pc heads of School A, C, and D explained as they give administrative support so that batteries and large classes have been prepared in order

to overcome constraints in implementing science radio broadcasts. Except this, the rest of them gave no reasons for the support. On the other hand, except the director and Pc head of school A that said an expert provided radio maintenance service, others have said that they never been provided. In line with this, the media experts in EMMA also said that they have not been provided maintenance from the center. In this case the experts gave no reasons.

The above lines of discussion indicate that the administration and maintenance support for science radio is very low.

4.1.7. Supervision

Teachers were asked to express the number of times they have been supervised while conducting science radio lessons since last year. Five options ranging from zero up to more than three were provided. Nevertheless, no teacher expressed as being supervised three and more than three times. On the contrary a large majority of them responded, as they have never been supervised. The summary result of the teachers' response is presented in table 4.10.

Table 2.10. Frequency and percentage distribution of supervision made in the teaching of science radio broadcasts since 1999 by teacher respondents

No of supervisions	Number of Teachers responded
Zero	15 (82%)
One	2 (12%)
Two	1(6%)
Total	18(100%)

There are a number of support services that enhance the quality of teachers' performance in teaching science radio broadcasts. If any one support is taken paramount, it is supervision. Actually, supervision can be made both from within and out of schools with the extent being as frequently as possible. In spite of this fact, 16 (88%) of the respondents reported that they have been never supervised since 1999. Coupled with this, 2 (12%) of them reported as they have been supervised only once and 1 (6 %) of them reported as two supervisions have been made while teaching science radio broadcasts. On the basis of this information's, it is quite clear that a large majority of teachers in the sampled schools have never been supervised since 1999. Therefore, as far as the relevance of supervision is concerned, the prevailing situation in schools indicates as it is marginalized.

With this regard, school directors and Pc heads as well as media experts witnessed this reality. Almost all directors and Pc heads concluded that they have never supervised teachers while instructing radio lessons because of the fact that they have made supervision in the last two or three weeks of each semester. Nevertheless, the media experts responded as they have been supervising. In this case a limited number of sampled schools will be covered so that supervision may not involve a large majority of schools.

4:1:8 Teaching behavior of science Teachers

In curriculum implementation various personnel are involved, but perhaps the one whose role is most important in seeing that the programs are successfully implemented is the teacher, who organizes learning experiences and manages the learning environment. In order to assess what teachers are doing in science radio classes of the

targeted grade level classroom observations were made with the help of observation checklist. The intention here was to measure the extent of teaching performance at the three phases. The possible options were yes, somehow and no .In this case those teaching tasks observed frequently were taken as being performed by the teacher. While those teaching behaviors observed rarely taken as being performed somehow, those did not observed taken, as being totally absent. See table 4.11 for the summary results of the teachers' behavior in radio classes.

Effective teaching is considered as creating favorable conditions in which appropriate learning occurs and the building of these conditions that foster the process. To be able to put this into practice and effect it reasonably, knowledge and skills of teaching that comprises teaching behaviors accomplished at the three phases of teaching (i.e. before the broadcast, during the broadcast, and after the broadcast) is very vital.

In this study teaching behaviors are divided in to three main teacher's activities. Each of which is significant and valuable to assess teacher's performance while implementing science radio broadcasts. Accordingly, the teaching behaviors are: activities before, during and after the broadcasts. Activities before the broadcast involve those instructional considerations such as lesson planning, arranging seats, lighting and airing the room, eliminating destruction, placing radio in the right position, taking students' attendance, revising previous lessons and raising pre-broadcast discussion. Activities during the broadcast include those instructional considerations such as: turning on radio at the right time, monitoring attentive listening, taking notes, briefing, asking students questions and encouraging students to participate in the broadcast program. Activities after the broadcast consist of raising post - broadcast discussion,

revising and concluding the radio lesson (program) and turning off the radio on time. With this perspective, 12 teachers in four of the sampled schools were selected and each teacher was observed for three broadcast sessions in which a total of 36 observations were made. These observations were carried out in three weeks duration on program numbers 17, 18, and 19 of both grade levels. After the observation results of each instructional considerations being completed, the summed result for each teaching behaviors were added together and averaged to give the results presented in table 4.11.

Table 4.11 Percentage distributions of the extent of teaching performance and the conditions of learning environments

Extent of teaching performance	Type of teaching behavior		
	Activities before the broadcasts	Activities during the broadcasts	Activities after the broadcasts
Yes	31%	45%	28%
Somehow	16%	41%	-
No	53%	14%	72%
Total	100%	100%	100%

The above summary indicates that 31% of the teachers that account for one-third of the total number performed the teaching tasks before the broadcast. Hence, they have been observed as they arranged seats, light and air the room, eliminate destruction, put the radio in the right position, plan the lesson, cheek student attendance, revise previous lessons, and above summary indicates that a small minority of teachers (26%) Observed doing teaching activities before the broadcast somehow moderately. It also shows that almost doing the teaching activities before the broadcast.

In addition, the above summary indicates that 48% of teachers have been observed while doing the teaching activities during the broadcast. Similarly, 41% of teachers observed while doing the teaching activities during the broadcast somehow moderately. In this case, teachers have been observed moderately doing the teaching activities such as: turn on radios on time, monitoring attentive listening, taking notes on the radio lesson, explaining main points, asking and giving response, and reinforcing of correct responses.

The table also indicates that 14% of the teachers have been observed without doing the major activities during the broadcast. In this case, the students were passively listening the broadcast. This shows a complete absence of monitoring of attentive listening, explaining main points, taking notes, asking questions, giving response for students' questions and reinforcing.

In the table above, it is also indicated that 28% of teachers observed while performing activities after the broadcast. In this case, teachers have been observed concluding radio lesson, revisiting radio lesson, conducting post-broadcast discussion and turning off the radio on time. As the summary indicated, only one has been observed while doing the teaching activities after the broadcast somehow moderately. At the same time, the large majority of teachers (72%) have been observed missing the activities after the broadcast. In here it is possible to understand that only one-third ($\frac{1}{3}$) of the teachers were conducting activities after the broadcast; the rest of them did not.

In the observed classrooms, one of the reasons for the complete absence of pre-broadcast and post-broadcast discussion was due to inconvenience of the scheduling time. In this case, broadcasts mostly begin and end at the very start or at the very end of the periods allocated in schools. For instance science radio for grade five starts at 8:25

A.M and 12:25 P.M for morning and afternoon shifts respectively. But the allocated period in schools ends at 8:40 and 12:40 for the morning and afternoon shifts respectively. Due to this reason, the broadcast ends at the same time while the allotted period ends. Thus, teachers mostly failed to conduct post-broadcast activities. Regardless of this, no one has attempted to use the next period time a week after the broadcast. Similarly, the scheduling time for grade six starts at the same time while the allotted period in school starts. Due to this reasons, teachers directly proceed to the activities during the broadcasts. In spite of this fact, no teacher has tried to utilize the adequate time after the broadcast to conduct activities before the broadcast for the next lesson.

In general, the results of classroom observations indicated that most of the teaching behaviors did not take place in the sample schools. Apparently, pre-broadcast and post -broadcast activities were marginalized in most of the observed classrooms.

4.1.9. Student activities in science radio classes

As far as meaningful learning in science is concerned students should be involved in various activities such as listening, note taking, questioning, answering and experimenting. The students' participation in such activities ensures that the students obtain adequate knowledge and skill in science. On top of this, it has been stated in the NETP (1994) that one of the specific objectives of education is to develop and enrich students' inquisitive ability and raise their creativity. In this regard, the above mentioned activates of students become paramount important.

The next two consecutive tables (i.e. table 4.12 and table 4.13) depict the summary result of the students' responses on the activities in science radio classes and the extent of their involvement in practical activities respectively.

An item in student questionnaire asked the kind of activities that the student has been doing in science radio classes. Four types of student activities were provided (i.e., listening note taking, questioning, and answering) In which case students can select more than one among the possible alternatives .See table 4.12 for the summary results for the students responses.

Table 4.12 Frequency and percentage distribution of the type of student activities during science radio broadcasts by grade level

Type of student activities	Student Respondents		Total
	Grade 5	Grade 6	
Listening	300 (100%)	300 (100%)	600
Note taking	188 (63%)	174 (58%)	362
Questioning	62 (21%)	40 (13%)	102
Answering	173 (58%)	187 (62%)	360

The above table illustrates the differences in proportion of students by the type of activities during science radio broadcasts. To begin with, all the sampled students in the two grade levels recorded as they listen during the broadcasts. When it comes to the activity note taking 188 (63%) of grade five students and 174 (8%) of grade six students that comprises a total of 362 (60%) students recorded as they take notes during the broadcast. This implies almost 50% of the respondent students take notes and the rest of the sampled students did not. With regard to questioning, it was recorded as an activity during science radio broadcasts by 62 (21%) of grade five students and 40 (13%) of grade six students. Totally 102 (34%) of the students ask questions during science radio broadcasts. This implies almost a large majority of the students (i.e., 498) did not get involved in asking questions that they may have doubt or unclear ideas of the

attended radio lessons. In addition to this, answering was recorded as a student activity by 173 (58 %) of grade five students and 187 (62%) of grade six students. In this case, a total of 360 (60%) students, which is a bit higher than 50% of the sampled students, involved in answering questions.

In general, on the basis of the results in table 4.12, it is quite understandable that the common activity for all the students is listening through the radio. Along with this, note taking and answering were an activity almost for half of the students. However, the activity asking questions is a task in science radio broadcasts for a few students that comprises almost one-sixth (1/6) of all the students. This indicates a disproportionate emphasis given to the student tasks while conducting science radio broadcasts.

In line with this, the observation results for this study indicated that asking questions were totally absent. Even note taking and answering questions were restricted to those who are volunteer and to those who sit in the front three or four benches. Except these, the rest of the students particularly, the backbenchers did not listen attentively. Due to this reason, learning from science radio broadcasts seems a mere listening

Table 4.13. Frequency and percentage distribution of the extent of practical activity by students’ grader level.

Extent of Practical activity	Student responded	
	Grade 5	Grade 6
Never	174 (58%)	203(68%)
Occasionally	55(18%)	55(18%)
Some times	62(21%)	40(13%)
Always	9(33%)	2(12%)
Total	300 (100%)	300 (100%)

As it is indicate in table 4.13, students rated the extent of performing practical activities in different way. 174 (58%) of grade five and 203 (68%) of grade six students rated, as they have never been participated in practical activities during science radio broadcast. While 55(18%) of grade five students and another 55(18%) of grade six students responded as they involved in practical activities occasionally, 62 (21%) of grade five and 40 (13%) of grade six student responded as they preformed practical activities sometimes. Coupled with this a very small proportion of students (i.e. 9 (3%) of grade five and 2(1%) of grade six students reported as they preformed always.

In line with this, among the many pressure groups, which influence science radio broadcasts, scheduling conflict, teaching load, and large class size were reported as major constraints adversely affecting teaching activities. The next three consecutive tables (i.e., table 4.14, 4.15,and 4.16) present the data obtained from teacher respondents respectively.

4.1.10 Scheduling Conflict

An item in teacher questionnaire asked the existence of scheduling conflict in their respective school. While a large majority of them informed, as it exists, a small minority of them informed, as it does not. See table 4.14 for the summary result.

Table 4.14 Frequency and percentage distribution of the existence of scheduling conflict by teacher respondents.

Existence of scheduling conflict	Teachers responded
Yes	14 (78%)
No	4 (22%)
Total	18 (100%)

As it is indicated in the above table, 14, (78%) teachers responded the existence of scheduling conflict in their respective school. Similarly, 4(22%) of the teachers responded, as it is not a felt problem in their respective school. Since the number denoting existence of scheduling conflict shows the large majority, it is possible to say that scheduling conflict can be taken as a problem in most of the sampled schools.

With regard to scheduling conflict, the inadequacy of the number of broadcasts per week has been reported by all directors and Pc heads since the broadcast time is twice in a week. For these reason, some schools utilize cassette and tape recorders. Where as others enforced to use merging two or more classes. As the media expert in EMMA described the limited number of broadcasting is due to crowded programs since the station is used to transmit broadcasts for different regions with different medium of instruction.

4.1.11 Teaching load of teachers

An item in a teacher questionnaire asked to rate the number of teaching load per week. Five alternatives ranging from below 10upto above 26 teaching loads were given. However, none of the respondent reported a teaching load below 10 per week. See table 4.15 for the summary result.

Table4.15 Frequency and percentage distribution of the number of teaching load by teacher respondents.

No of teaching load per week	Teachers responded
10 - 15	1 (6%)
16 -20	3 (18%)
21 - 25	12 (67%)
Above 26	2 (12%)
Total	18 (100%)

The above table indicates that teaching load per week differs in proportion from teachers to teachers. Only 1 (6%) of the teachers responded a teaching load 10 – 15. Besides 3(18%)of them responded a teaching load between the numbers 16 -20. In addition to this, 12 (67%) of the teachers reported a weekly teaching load between 21 - 25. And 2(12%) of the teachers reported a teaching load above 26 periods per week. From this it is possible to conclude that a large majority of teachers have a large teaching load that may adversely affect their performance in teaching as well as in planning radio lessons.

Considering high teaching load as a major constraint of implementation, directors in school A, B, C, D, E, and F explained as they persistently informed for ZEB. However, there is a serious shortage of teachers in which the problem resumes its existent. Regardless of this, directors in school B and C asserted that they have been using a large room that can accommodate students of two or three classes.

4.1.12 Large Class Size

Teachers were asked through a questionnaire whether or not large class size adversely affect their teaching activities in science radio classes. Two alternative answers (i.e., yes or no) were given. See table 4.16 for the summary result.

Table 4.16 Frequency and percentage distribution of the presence of impact as a result of large class size by teacher respondents.

Presence of impact	Teachers responded
Yes	12 (67%)
No	6 (33 %)
Total	18 (100%)

The above table indicates that teaching load per week differs in proportion from teachers to teachers. Only 1 (6%) of the teachers responded a teaching load 10 – 15. Besides 3(18%) of them responded a teaching load between the numbers 16 -20. In addition to this, 12 (67%) of the teachers reported a weekly teaching load between 21 - 25. And 2(12%) of the teachers reported a teaching load above 26 periods per week. From this it is possible to conclude that a large majority of teachers have a large teaching load that may adversely affect their performance in teaching as well as in planning radio lessons.

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Presence of impact	Teachers responded
Yes	12 (67%)
No	6 (33 %)
Total	18 (100%)

As shown in the above table, 12 (67%) teachers responded the presence of influence as result of large class size. And similarly, 6(33.%) teachers responded the absence of impact as a result of large class size. On the basis of this information, it is possible to understand that large class size is not a problem almost for one-third or lower than 50% of the respondents. However, almost for two -third or higher than 50% of them, large class size created influence upon teaching science radio broadcasts in schools. Generally, based on the above table it is important to remember that large class size is a problem in most of the sampled schools. In connection to this, classroom observations in school B ascertained that chairs or desks are not found in the large class. In such classrooms, students sat on the floor where there is only one table to put the radio set.

The results presented in the following two consecutive tables show the attitude scores of teachers and students. While table 4.17 presented the attitude score of teachers, table 4.18 presented the attitude score of students. Actually, the attitude score was measured in terms of variables such as: satisfaction with science radio broadcasts, extent of like or dislike, feeling towards science radio broadcasts, and opinion on benefits obtained from the broadcasts.

4.1.13. Teachers attitude towards science radiobroadcasts

Teachers were asked to rate statements that are intended to measure the extent of opinion towards science radio broadcasts. The rating scale was constructed in the form of Likert scale .In this case, teachers have five alternative to select ranging from strongly disagree up to strongly agree. Twelve item opinion statements were used as a measuring device. See table 4.17 for the summary result of the teacher's responses.

Table 4.17 Frequency and percentage distribution of attitude score above and below the median by teacher respondents.

Category	Teachers responded	
	Frequency	Percentage
Above Median	13	72%
Below median	5	28%
Total	18	100%
$\chi^2=3.556$		

In A chi - square (χ^2) table, the expected value at the 0.05 level of significance is 3.841. Since the observed χ^2 value (i.e., 3.556) is less than the expected χ^2 value (i.e. 3.841) at the 0.05 level of significance, the values associated with 13/5 is not statistically significant. However a look at the distribution of the results the same table revealed that in general out of 18 (100%) teacher respondents, most of them, 13 (72%), fall above the median. Similarly, some of them whose number and percentage is 5 and 28% respectively fall below the median score. Based on this result, it is possible to understand that the majority of science teachers have positive attitude towards the broadcast. At the same time, a small minority of teachers have negative attitude.

4.1.14 Students' attitude towards science radiobroadcasts

Students were asked through questionnaire to rate statements that are intended to measure the extent of opinion towards the broadcasts. The rating scale was constructed in the form of Likert scale. Opinion statements of 12 items were employed,

with five alternative answers ranging from strongly disagree to strongly agree. See table 4.18 for the summary result of the student's responses.

Table 4.18: Frequency and percentage distribution of attitude score above and below the median by students' grade level

Category	Student respondents	
	Grade 5	Grade 6
Above Median	204(68%)	198(66%)
Below Median	96 (32%)	102 (34%)
Total	300(100%)	300 (100%)
$X^2=0.271$		

As shown in table 4.18, the computed chi-square value is 0.271. The expected chi-square value in a chi-square table at 0.05 level of significance is equal to 3.841. Since the computed chi-square value is less than the expected chi-square value, the obtained frequency distribution is statistically insignificance. Similarly, the table revealed that a relatively small proportion of students fall below the median scores. Based on this, it is important to remember that the large majority of the students in grade 5 and grade 6 have positive attitude towards science radio. At the same time, relatively a small minority of them have negative attitude towards the broadcasts.

4.1.15. Communication Systems employed at the stage of development and implementation of science radio.

In order to secure information about the existing state of communication employed at the stage of development and implementation, an interview was made with school directors, PC heads, ICDR science panel head, EMA science radio broadcasters of grade 5 and grade 6, and REB. The information obtained is given below.

In the first place, according to ICDR science panel head, the link between EMMA and their institution is very loose in that their cooperation doesn't exceed exchanging information at various seminars and workshops. Besides, he explained that the tasks of ICDR is restricted to the preparation of syllabi for different grad levels so that according to him working on the development of science radio programs is beyond their assigned task. Due to this reason, he said that he has never been involved in the process of developing science radio broadcasts. He also said that there is nothing in between that makes them to exchange information since the radio programs are selected from the student's text of the grade level.

In line with this one of the expert in EMMA describes as follows:

There is interaction between user schools and the Agency as a result of supervision and program evaluation studies. The Agency conducts supervision in sampled schools twice a year. Moreover at the end of each academic year the agency conducted program evaluation studies in order to improve the program effectiveness. Classroom teachers have been the major sources of information.

Similarly, the other media expert explains the following: "The communication between the Agency and user schools is satisfactory since supervisions and maintenance Services are provided for the user school."

In spite of these facts, both of them failed to cite a single example where the program content has been changed as a result of feedback obtained from evaluation. In

addition, both of them described the absence of providing feedback to the user schools. In this instance, it is quite understandable that the communication system shows a one-way flow.

With this connection, the REB Official said that the communication between EMMA and region 14 is satisfactory. In that media experts and region 14 education experts work cooperatively both during planning and implementation of science radiobroadcasts. The official also described that the agency communicate the user schools in a way of exchanging information about broadcast schedule supplying teacher guides for science radio. In the same manner, conducting research, obtaining feedback and in-service training help to communicate effectively. Regardless of this, virtually all school directors informed the existence of communication with the agency in terms of exchanging information about scheduling .On top of this, they all described the absence of feedback sent to science teachers.

From the above point of discussion, it is possible to conclude that the communication of EMMA and user schools is restricted to supervisions, summative evaluation and exchanging time table (scheduling).

4.2. Discussion of Findings

4.2.1 Planning and development in Science radio broadcasts

The effects of radio on science curriculum manifest themselves at two levels: at the planning stage in instructional development and at the implementation stage in terms of the strategies adopted by teachers.

At the planning stage quite a number of decisions will be made on determining aims and objectives, allocation of human and material resources, selection of contents for the radio program, designing teaching strategies, instructional development, production, transmission, and in-service training. In this case, decision requires considerations of various aspects of program development and implementation. Due to this reason, decisions at this stage entirely depends on the cooperative efforts of those who are directly involved in the process to put science radio broadcasts into practice. In this regard, the cooperation of EMMA experts, ICDR experts and local teachers is paramount importance. Taking into account, cooperation between broadcasting organization and existing educational system as a vital element for sustainable radio programs, Lockheed and Middleton (19991) suggested the need to establish cooperation between educators, broadcasters and creative talent in broadcasting. In spite of this fact, the findings of this study revealed that the cooperation between those who are involved in the process doomed to die. For instance as indicated in table 4.4, out of 18 (100%) teacher respondents a large majority that is 16(89%) of them have never participated in instructional development and in-service training. ICDR expert in which case the expert has never been involved in the planning and development of science radio broadcasts provided a further clue.

Besides this, according to the interview result with EMA expert, even those very few local teachers involved in planning and development, participate only in content selection. One of the shortcomings in this kind of limited participation is that teachers tend to believe that their role is only in the classroom, to implement what they have received from the media agency. In a sense, it is accurate to say that the vast majority of teachers do not involve in making decisions regarding the aims and objectives, teaching strategies, production and transmissions of science radio programs. Moreover, the large proportions of them have been marginalized from involvement in in-service training. As a result of these, most of them enter the process at a much later stage, usually during implementation or actual use. Although the main activity of teachers is instruction, which involves creating, using, and modifying instructional strategies in the classroom, the work of the teacher is not limited to the classroom or to implementation. Rather, he is expected to participate actively in all other phases of the process (i.e., development, planning, and evaluation). Broad participation in these phases even makes his main classroom work more effective.

Participation of teachers throughout the stages of radio programs, especially at the initial stages is very vital both in making the radio programs relevant and raising degree of its acceptability among students. Nevertheless, keeping science teachers away from planning and development, which is a typical characteristic in A.A., is a waste of valuable resources. Along with local teachers, the contribution of ICDR experts should not be undermined. Because their expert's opinions and comments enable the program to be pedagogically sound and appropriate to the target audience. And if possible the participation of school directors, pc heads, students and parents also contribute a lot for the quality and appropriateness of the program to meet the intended purpose.

4.2.2. Implication of Science radio broadcasts in the primary Schools

Educational policy makers are the initiators and overseers of educational reform. Thus educational policy statements determine the direction on what will be taught and how it will be taught, and provide suggestions for teaching. With this perspective, the policy statement of MOE during the socialist government (1987) says that the major objective of educational media is to support the curriculum. Similarly, the major aim of educational mass media in the Federal government is to promote the quality of education. Based on the above two policy statements, it seems logical that improving the system of education is the prominent contribution of media. Nevertheless, the strategy employed to attain the intended purpose is quite different. This means that the strategy was designed to give support during the socialist government and Co-teaching in the case of Federal government. The support implies that the radio programs are an additional element to the classroom teacher's instruction hence may have less value. In contrast to this, co-teaching implies that the radio programs are the compulsory element to the classroom teacher's instruction hence may have high value. In line with this, based on the information obtained from EMMA expert, the shift from support program to Co-teaching demands strong effort on the part of classroom teachers while conducting each radio lessons. Regardless of this fact, the findings of this study indicated the opposite. Most of the time, students have been observed listening passively to the broadcasts. In this case, the teaching behavior of classroom teachers did not exceed more than turning on and off the radio and trying to eliminate distractions. In some cases teachers do not conduct pre-broadcast and pos-broadcast activities. Besides this, the classroom environment was not conducive to the teaching learning process since around two hundred students were congested in one class with some of them sat on the

floor. In such classrooms, learning through the radio is a mere listening of the broadcast. Therefore it is possible to say that co-teaching is understood as a substitute of the classroom teacher. Due to this reason, it is possible to say that Co-teaching is understood as substituting the classroom teacher.

The actual implementation of science radio broadcasts was also characterized by other problems. In some schools students attend the radio lessons in a classrooms without chair (desk). With regard to instructional resources and support services, teachers have been reported inadequacy of radios, teacher guides, administrative support, maintenance and supervision. Even in some schools, batteries are not available. Also there was poor sound quality particularly, during afternoon broadcasts in which case audibility was limited only for those who sit in front rows.

Because of confronted with such constraints the basic elements of an orderly learning environment are frequently missing. The conditions in many schools are so chaotic that it seems miraculous that learning occurs at all, and much of what does occurs appears to be haphazard rather than the result of a deliberate focus on the program content and instruction.

4.2.3. Science radio programs content and presentation

Effectives of instruction in the classroom are closely related to the clarity and understandability of the lessons presented to the students. With this view in mind, it is important to analyze the programs content and presentation of science radio broadcasts in two ways. On the one hand, from the point of media principles, such as: mode of presentation, variety of formats, and suitability to the learners' age and ability level. In this regard, it was proved as being well considered in science broadcasts of the targeted grade levels. On the other hand from the point of science teaching strategies,

there is a severe problem on the part of the programs. This is mainly due to the complete absence of those relevant teaching strategies such as: problem -solving, inquiry and experimentation. With this connection, Capper (1994:20- 23) says that instruction which relies primarily on teaching students to acquire facts and which neglects to teach them the use of these facts fails to impart real understanding. He further noted that such learning is viewed by students and teachers as "getting the rough the contents" and "passing the test" rather than knowing, thinking, understanding, and using it. Both the results of content analysis and observations of this study indicated the same as what has been mentioned above. The results of content analysis indicate the absence of suggestions to use science kits and laboratory apparatus and open- ended evaluative questions. And a rare presence of suggestion to use practical activities, visuals and, discussions. Similarly, the observation result and the students' response indicated that the main activities of the students in the classroom were listening and paper-and pencil work with a few students participating to respond questions.

In sum, along with listening, talk-and-chalk as well as paper-and- pencil were the main activities of the teacher and the students respectively. Hence less or no emphasis was given to meaningful and in-depth learning.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMENDATIONS

5.1. Summary

Radio broadcasting has been recognized as an effective means of bringing change in the field of education. However, the process of implementing radio broadcasts is a highly complex one and therefore requires an extremely skillful assortment of participants and relevant content for effective result. Whether or not radio broadcasting is effective in making real of the intended purpose has felt essential to conduct this study. More explicitly the present study was undertaken for the following specific purposes: to examine the extent to which the intended program is put into practice, analyzing the attitude of students and teachers towards the broadcast, identifying the role played by teachers, to find out problem content and presentation, and assessing the extent to which the learning teaching environment is conducive.

The study employed survey research methodology. Both quantitative and qualitative data collection instruments were used to obtain adequate information. In the selection of zones, woredas, and schools a random sampling technique was utilized. Thus from two sampled zones (i.e., zone two and zone four) a total of six schools (i.e., three schools from each zone) were randomly selected. From each grade level, a total of 50 students of which 25 of them are female and 25 of them are male were selected using cluster-sampling technique. Consequently, a total of 600 students were participated to fill in the students' questionnaire. The data were collected directly from the source through administration of the students' questionnaire.

Besides, 18 science teachers of grade five and grade six in the sample school participated to fill in the teachers' questionnaire. Classroom observations were also made on twelve teachers in which case three observations were conducted for each teacher in duration of three weeks that account thirty-six observations. In addition, fourteen sampled science radio programs were analyzed using content analysis rating from. A total of twenty-eight sampled programs of the targeted grade levels were analyzed. The data were tabulated for analysis, which included statistical applications involving frequency counts, percentages, averages, median, and chi-square test.

The results of the questionnaire administered to the students indicated that majority of the students have positive attitude towards the broadcast. Moreover the activities of the students during science radio broadcasts consist of listening, note taking, answering and questioning in different proportions. And it was listening which is reported by all students as the major activity. Along with this, note taking, questioning, and answering were reported by some of the students. However, only very few students reported the existence of practical activities during science radio broadcasts. This implies that the broadcasts have limited contribution to the students. The result also shows that listening is the most dominant activity of the students although practical activities are extremely marginalized. These instances strongly disagree with the policy statement that directs the participation of the students to be investigative and creative (NETP, 1994:5). Similarly, from the point of view of meaningful learning in science, the students' activities lack the essentials of practicing and/or experimenting.

Students reported that some factors like overcrowded classes, light distortion and noise as a major constraints for implementation of science radio. This means science radio broadcasts in schools do not get the necessary consideration by school

administrators. Based on this information it is possible to say that science radio is implemented without due consideration being given to solve implementation constraints. On top of this a large majority of the students informed that the number of science radio broadcasts is inadequate and therefore needs to increase in number.

The information obtained from teachers indicated that the majority of science teachers have a positive attitude towards the broadcast. Besides, they suggested the need to increase the number of science radio broadcasts. Moreover, most of the teachers have recognized the program content and presentation as being important to provide learning as well as teaching relevance. Along with this they reported that the program is appropriate for the students ability and age level. This implies that science radio has an instructional relevance benefiting both the students and the teacher as well.

The results of the teachers' questionnaire also revealed that some of the teachers assigned to teach science for the targeted grade levels are less qualified. Besides, the participation of teachers in in-service training is inadequate in which case the result shows a large majority of the teachers have never been participated. Along with this majority of them have never been involved in planning and development of instructional programs for the radio lesson. This means lack of concern by those planners and administrators for effective implementation of science radio broadcasts in schools. However, it has been stated in the policy statement of NETP (1994) that mechanisms by which teachers and beneficiary participated in the preparation and evaluation of the curriculum. In view of this fact, the current practice with regard to the implementation of science radio broadcasts could mean the contrary there by indicating weakness on the part of implementers particularly school administrators, Education Bureau officials and personnel of media agency.

Through the questionnaire, most of the teachers responded that radio sets and radio teacher guides are inadequate. Coupled with this, they have reported the problem of radio functions, which can be associated with poor quality of the equipment, poor maintenance service as well as low frequency of sound wave. All these indicate the existence of problem in the supply side of equipment delivery and lack of follow up and support service for effective use of radio in schools.

In addition to this teachers indicated the existence of problems as a result of large class size, scheduling conflict and high teaching load in which case it is still possible to say that the planners as well as school administrators do not give careful consideration for the various constraints that adversely affect radio use in science. Moreover, a large majority of teachers reported the absence of maintenance service and supervision, which is also an indicator of lack of coordination between the agency and the user schools. Furthermore, this result indicated loose coordination of those implementers in the process of implementing science radio. It also indicates the absence of feedback mechanisms for improving effective implementation.

Classroom observation result indicated the presence of quality and appropriateness of the program content and presentation in terms of media principles. In spite of this, the observation result is an indicator of problems in implementing science radio in schools. For instance, passive listening was the only task for the large majority of the students. In most of the observed classrooms teachers have not been seen conducting pre-broadcast and post-broadcast activities. In some observed classes, students attained the broadcast lessons in a class with out chair. Almost in all classes there was overcrowded students in which the teacher cannot move in between rows. In

line with this, most afternoon broadcasts have a sound quality problem. Besides reception of programs on the receiving sets was not clear and audible.

The observation result indicates scheduling conflict of the broadcast time and the allotted periods for science radio in schools. It also indicates some weakness on the part of science teachers to accomplish the basic tasks of teaching radio lessons. It also indicates lack of careful consideration by those planners and school administrators.

The result of content analysis was also an indicator of strength in some aspects of the radio teacher guides for science. However, the results also indicate weakness on certain aspects. As shown in table 4.5, the program content is good enough from the point of view of preparing curricular materials. However, from the point of view of including basic elements of teaching science, the teacher guides failed to succeed. Thus, it is possible to say that the material cannot serve the purpose intended in terms of helping the teacher to conduct meaningful instruction in science.

5.2. Conclusions

From the findings of this study, the following conclusions can be drawn:

1. At present there is a failure of collective efforts on the part of those EMMA experts, ICDR experts and to lesser extent teachers during the planning and development of science radio programs.
2. The link between EMMA and the educational system during the stage of development and implementation of science radio broadcasts seems very far from adequate. In this particular respect, communication between the agency and the user schools does not exceed more than exchanging information about time - table (scheduling).
3. Most of the students and Science teachers of the targeted grade levels have positive attitude towards Science radio broadcasts.
4. From the context of media principles, the program is quite appropriate in which case it may contribute for the positive attitude of teachers and students towards the broadcast. Nevertheless the program failed to succeed from the context of teaching strategies for science. This is so because, the programs entirely ignored problem solving, inquiry, and experimentation approaches.
5. With varying degrees of consequences, the existence of unfavorable conditions in the schools as well as outside factors appear to have contribution to the ineffectiveness of the implementation process. Among the in-school factors, the existence of ill-equipped classrooms with the necessary furniture, Inadequate supply of instructional resources (i.e. radio sets, teacher guides, cassettes, batteries and sockets), are the major once.

6. Assigning less qualified teachers, a serious shortage of in-service training exposure for teachers, the absence of pre-broadcast and post-broadcast activities as well as promoting passive listening are also the most prominent ones.
 7. In addition to these, the presence of some school directors who are less concerned about the instructional problems, large class size, high teaching load, and inadequate maintenance and supervision seem to have aggravated the problem.
-

5.3. Recommendations

In the light of the findings of the study, it seems reasonable to suggest the following recommendations.

1. As far as teaching science through the radio is concerned, the medium is only as good as the programs it receives. For this reason, the cooperation of EMMA experts, ICDR experts, science teachers of the targeted grade levels, school directors, PC heads, and Zone education Bureau experts may have a paramount importance.
2. There should be a two-way communication channel in between EMMA and the user schools. Particularly providing report of evaluation results on a timely basis as well as providing teachers with easy-to-read reports, which analyze students' problems and offer concrete suggestions for how to improve instruction.
3. In order to survive implementation of science radio broadcasts as a viable educational option, the programs should match the needs of students. Similarly, it should fit with the strategies of science teaching coupled with the learning environment where the broadcasts are implemented in schools. Moreover consideration must be given to congruence between teachers' needs and abilities and the demands of using radios in the primary schools.
4. Provide teachers with training and assistance in classroom instruction and use of science radio broadcasts.
5. Provide orientation in the form of workshop and seminar to change the attitude of administrators, teacher trainers, and school supervisors about the benefits and strategies of implementing science radio broadcasts.

6. If consideration is given during planning and implementation, science radio is a potential one to provide enriched learning experience for the learner and relevant teaching methods for the teachers as well. So improving the quality of programs content and presentation could bring about a desirable impact.
7. In order to implement science radio broadcasts effectively, planning could no longer be approached as a process of sequencing everything worth knowing. Thus, planners must be very selective in choosing the content to be learned in schools. The goal is no longer to have students store away vast amount of facts about science. High-level competencies must be developed .For instance, the ability to analyze and evaluate existing knowledge; to recognize patterns in different orders; to apply knowledge to new situations, which in time serves in making strategies and solving problems. Preparing students worksheets student activities, discussions, open-ended evaluative questions and inquisitive questions are very vital for such purposes.

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Appendix 1

Questionnaire for grade five and grade Six Students

This study is aimed at evaluating the implementation of grade six science radio broadcasts in the primary Schools of Addis Ababa. The purpose of this questionnaire is to obtain information about the attitude of students toward science radio broadcast, implementation constraints, and program organization and content.

Section I. Personal Data

Zone _____ Name of the School _____

Age _____

Sex: Female _____ Male _____

First Semester Score in Science _____

Section II. Attitude

Instruction Two

Each of the statements below expresses an attitude toward science radio broadcast. Please put a mark with a tick (✓) what your opinion is with respect to each statement in only one of the five alternatives. (i.e., 5= strongly agree, 4= agree, 3= uncertain, 2= disagree, and 1= strongly disagree.)

No	Items	5	4	3	2	1
1	Science radio broadcast is very interesting to me					
2	I don't like science radio broadcast; it scares me to have to take it.					
3	I am always under a terrible strain in a science radio class					
4	Science radio broadcast is fascinating and fun					
5	Science radio broadcast makes me feel secure, and at the same time it is stimulating.					
6	Science radio broadcast makes me uncomfortable, restless, irritable, and impatient.					
7	In general I have a positive attitude toward science radio broadcast.					
8	When I hear the science radio broadcast, I have a feeling of dislike.					
9	I have always enjoyed hearing science radio broadcast in school.					
10	I get more satisfaction from lessons supported by radio than lessons without radio					
11	I achieve higher mark with subjects supported by radio than subjects without them					
12	In general I have positive attitude towards Science broadcasts.					

Section III. Implementation constraints, program organization,
and contents

Instruction Three

Please mark with a tick (✓) your responses on the space provided except the questions, which require written responses. You can have more than one answer for each question.

1. What are the activities that you have done in science radio classes?

a. Listening

d. Experimenting

g. Dialogue_____

b. Asking_____

e. Practicing__

h. Others/specify_____

c. Answering_____

f. Discussing__

2. Do you think science radio broadcast helps you achieve more results in science subject?

Yes _____ No _____

3. Do you think the numbers of radio programs are adequate?

a. Yes _____ b. No _____

4. Would you list the problems that you encountered in science radio classes?

5. What do you say about the things to be improved for the better implementation of science radio broadcast?

6. Would you comment science radio broadcasts?

Appendix 2

Questionnaire for Science Teachers

The study is aimed at evaluating the implementation of science radio broadcast for grade six in the Primary Schools of A.A. Your school has been selected to participate in the present study.

The purpose of this questionnaire is to collect information about:

- Availability and use of science radio in Schools.
- Teachers' attitude toward Science radio broadcast.
- Preliminary and in-service trainings.
- Implementation constraints of Science radio in Schools
- Program organization and contents of science radio

The information to be obtained through the questionnaire is going to be used only for the study undertaking. Therefore, the Cooperation of teachers by giving genuine information is highly valuable to complete the study. Your genuine information is felt essential for providing adequate data in order to bring about improvement in the quality of Science radio programs ensuring better implementation. All information you provide will be treated as confidential. So, You are requested to complete the questionnaire as genuinely as you can. Do not write your name on the questionnaire.

Thank you in advance
for your cooperation

General Direction

This questionnaire consists of five sections. Section one deals with personal data, section two deals with availability and use of science radio, section three deals with teacher's attitude, section four deals with implementation constraints, and section five deals with program organization and content. Please carefully read the instruction at the beginning of each section.

Section One Personal data

Instruction I

Please mark with a tick (✓) your responses on the space provided except the questions, which require written responses.

1. Zone: Two_____ Four_____
2. Name of the School_____
3. Sex: Female _____ Male_____
4. Qualification: 10 + 2 _____
12 + 1 _____
12 + 1st round summer course in the TTIs_____
12 + 2nd round summer course in the TTIs_____
5. Total Service years in teaching profession:
Below 1 year _____ 11-15 years_____
- 1-5 years_____ 16-20 years _____
- 6 – 10 years_____ above 20 years_____
- 6 For how long have you thought Science radio broadcast?
For the first time_____
- 2-5 years_____
- 6-10 years _____
- Above 10 years _____
7. Your total teaching load in periods per week
Less than 10 _____ 21 – 25 _____
- 10 – 15 _____ above 26_____
- 16-20 _____

Section two. Availability and Use

Instruction II

Please mark with a tick (✓) your responses on the space provided except the questions, which require written responses.

1. Do you think radio sets are sufficient in your school?
Yes_____ No _____
- 2.How often are the radio sets at your possession function in your school?
Always ____ occasionally____ uncertain____ sometime____ never_____

3. How often do you use radio for grade five or six science?

----- 4.

4. Do you think there is a sufficient number of radio lesson manuals and teachers' guide for science radio for grade six?

Yes _____ No _____

5. Do Science radio broadcasts for grade six matches with reception schedule at your school?

Yes _____ No _____

6. Were a timetable and supporting materials for suggested activities provided well in advance of science radio broadcast?

Yes _____ No _____

7. The present number of science radio broadcasts for grade six has to be expanded to cover all elements in the syllabus?

a. Yes

b. No

Section three. Teacher's attitude towards Science radio broadcast

Instruction III

Each of the statements below expresses an attitude toward Science radio broadcast.

Please put a mark with a tick (✓) what your attitude is with respect to each statement in only one of the five alternatives. (i.e., 5= Strongly agree, 4 = agree, 3= uncertain, 2= disagree; and, 1= strongly disagree)

No	Item	5	4	3	2	1
1	Science radio broadcasts can help the teacher.					
2	Science teachers have a good opportunity to learn teaching techniques from radio broadcasts.					
3	The quality of education will not decrease if we give up school radio broadcasts.					
4	Science radio broadcasts can make students more interesting in their learning.					
5	Students will achieve more in academic subjects with radio rather than without it.					
6	Science radio broadcast makes me secured.					
7	I dislike not only hearing but also thinking about science radio					
8	I become more flexible in managing students in the classroom.					
9	I am willing to continue radio use even if it is inconvenient.					
10	Science radio broadcast is stimulating.					
11	I am always happy if we give up listening science radio broadcasts					
12	In general I have a positive attitude towards science radio broadcasts					

Section Four. Teacher training and Implementation Constraints
Instruction IV

Indicate your responses for the following questions by circling the letter of your choice except the questions, which require written responses.

- 1. Have you taken teacher-training programs?
a. Yes _____ b. No _____
- 2. Do courses of teacher training that you took include how to implement radio lessons?
a. Yes _____ b. No _____
- 3. How often have you participated to develop science radio programs?
a. Never b. Once c. Twice d. Three times
e. More than three times.
- 4. How often have you been observed by media supervisors last year
a. Never b. Once c. Twice d. Three times
e. More than three times.
- 5. Adequacy of maintenance services from the center?
a. Adequate b. Inadequate c. More than enough
- 6. How often have you participated in the in-service training of teachers over the last three years?
a. Never b. Once c. Twice d. Three times
e. More than three times.
- 7. How do you rate the support provided by the school director to the implementation of science radio broadcast for grade five or grade six?
a. High b. Medium c. Low
- 8. Does the size of students per class have created a problem on the proper implementation of science radio broadcasts for grade six?
a. Yes b. No
- 9. If your answer for question number six is "a", please mention the instructional problems you have faced _____

Section five. Program organization and contents of science radio
Instruction v

Please mark with a tick (✓) your responses on the space provided.

1. How often have you participated to develop science radio programs?
a. Never b. Once c. Twice d. Three times e. More than three times.
2. Science radio programs present accurate, well-organized content in an interesting and engaging manner.
a. Yes_____ b. No_____
3. Science radio programs provide clear and straightforward instructions, which are consistent from program to programme.
a. Yes_____ b. No_____
4. Science radio programs incorporate response pauses that are neither too long nor too short.
a. Yes_____ b. No_____
5. Science radio programs provide clear guidance to the classroom teacher through complete program notes and on air instructions, which enhance the teacher's self-esteem, confidence and ability.
a. Yes_____ b. No_____
6. Is the content of the programs suitable to the age level and interests of the students for whom it is intended?
a. Yes_____ b. No_____
7. Do you think the number of radio programs of grade 5 or 6 are adequate?
a. Yes_____ b. No_____

Appendix 3
Classroom Observation checklist

Zone____Name of the School_____

Grade level____Date of Observation_____Period _____

Lesson Topic_____

No.	Instructional Consideration	Yes	Some how	No
1	Available Classroom space for the students			
2	Reception of programs on the receiving sets was clear and audible			
3	Integrating other educational media with the radio lesson			
4	Does the teacher arrange sets			
5	Does the teacher lights the room			
6	Does the teacher attempt to eliminate distraction			
7	Does the teacher put the radio in the right position			
8	Does the teacher plan the lessons			
9	Does the teacher check students attendance			
10	Does the teacher revise previous lessons			
11	Does the teacher conduct pre-broadcast discussions			
12	Does the teacher turn on radio on time			
13	Does the teacher monitor attentive listening			
14	Does the teacher take notes on radio lesson			
15	Does the teacher explain main points			
16	Is there questioning and answering during the lesson			
17	Is there immediate feedback and reinforcement of correct responses			
18	Does the teacher conclude radio lesson			
19	Does the teacher revise radio lesson			
20	Does the teacher conduct post-broadcast discussion			
21	Does the broadcaster use repetition and anticipate effectively			
22	Does the program begin and end in a standard way (often them music)			
23	Does the program use relaxation segments to break the intense concentration listening requires			
24	Does the program incorporate a variety of formats			
25	Does the teacher turn off the radio on time			

Appendix 4

Content Analysis rating form

	Categories	Yes	No
1	Present accurate and well-organized content in an engaging manner.		
2	Provide clear guidance to the classroom teacher.		
3	Provide clear and straight forward instructions		
4	Provide good teaching techniques from which teachers can learn		
5	Incorporate response pauses that are neither too long nor too short.		
6	Suitable to the age level and interests of the students.		

Appendix 5

List of sampled radio programs of the targeted grade levels

S.No	Grade 5		Grade 6		Total
	1 st semester program No	2 nd semester program No	1 st semester program No	2 nd semester program No	
1	1	15	1	14	4
2	2	16	3	17	4
3	4	19	6	19	4
4	7	20	7	21	4
5	8	22	9	23	4
6	10	24	11	26	4
7	13	28	13	27	4
Total	7	7	7	7	28

Appendix-6
Interview guide for Media experts and Curriculum Expert
REB official

1. What do you say about the contribution of grade five and six science radio broadcasts for the teachers and students as well?
2. Would you mention the supporting materials that you have provided for the user schools? Do you think the support is adequate? If not what do you say about the reasons?
3. Would you briefly discuss about in-service training?
-It's benefits, demands, capacity, frequency, and involvement.
4. Do curriculum experts and local teachers participate in the process of producing and transmitting grade 5/6-science radio broadcasts? If yes how? If no why?
5. Do you think the contents of grade six science radio broadcasts go in line with the current curricular changes? If no describe about the measures that you have taken in order to make it suitable?
6. What are the constraints that you have faced in the process of production and transmission of grade six science radio broadcasts?
7. What do you suggest for the betterment of grade 5/6 science radio broadcasts?
8. Would you comment about the program?

Appendix-7

Interview prepared for school directors and PC heads

1. What do you say about the adequacy of radio sets, radio manual, and student's material?
2. Would you briefly explain about radio function and frequency of radio use in your school specific to grade five and six science radio broadcasts?
3. Would you discuss about the use of electric power, batteries, cassettes, and tape recorders?
4. What are the constraints that you have faced in implementing grade six science radio broadcasts?
5. What do you comment about the efforts of grade six science teachers for effective implementation?
6. What do you suggest for the betterment of science radio broadcasts?
7. Would you comment about the program?

Appendix-8
Term of Reference

S. No	Unit of Analysis	Unit of observation	Source of Information	Instrument to be used
1	Availability and Use	Radio sets, radio manual, student's material, radio function, and frequency of radio use, electric power, batteries, cassettes, and tape recorders.	Teachers Students Head of PC	Questionnaire Observation Interview
2	Attitude	Radio's contribution, the extents of like or dislike towards the broadcast, meeting students' ability and interest, and teachers expectations.	Teachers Students	Questionnaire
3	Training (preliminary and In-service	Involvement, benefits, demand, capacity, and frequency.	Teachers Directors	Questionnaire Interview
4	Implementation constraints at a school level	Class size, scheduling conflicts, reception difficulties, supporting materials, administrative support, finance, maintenance service feedback mechanism, and supervision (from within and outside).	Teachers Students Directors Head of PC	Questionnaire Observation Interview
5	Program Organization and Content	Developers, content coverage, support for inquiry, supports for the teacher, and suitability for the target audience, and contribution to the current syllabus.	Teachers Students Media Expert Documents	Questionnaire Document Analysis
6	Production and Transmission	When, how, by whom, constraints, modification to coincide with the current syllabus, the participation of curriculum experts and local teachers.	Media Experts Curriculum Experts	Interview
7	Integration with other media	Visuals, modules, and concrete experiences	Teachers Students	Observation Interview
8	The role of the teacher	Activities before the broadcast, during the broadcast, and after the broadcast.	Teachers	Observation Interview
9	Students' participation	Listening, answering, questioning experimenting, practicing, discussing, and	Students	Observation Interview

Appendix-9

A.) Computation of observed chi- square Value

Frequency	Above Median	Below Median
Observed	13	5
Expected	9	9
$f_o - f_e =$	$(13 - 9) = +4$	$(5 - 9) = -4$
$(f_o - f_e)^2 =$	16	16
$(f_o - f_e)^2 =$	$\frac{16}{9} = 1.778$	$\frac{16}{9} = 1.778$
$X^2 = \sum \left(\frac{(f_o - f_e)^2}{f_e} \right)$		
$= \frac{(13 - 9)^2}{9} + \frac{(5 - 9)^2}{9}$		
$= \frac{16}{9} + \frac{16}{9}$		
$= 3.556$		

In A chi - square (x^2) table, the expected value at the 0.05 level of significance is 3.841. Since the observed x^2 value (i.e., 3.556) is less than the expected x^2 value (i.e. 3.841) at the 0.05 level of significance, the values associated with 13/5 is not statistically significant.

B.) Calculation of the chi-square (X^2) test for the attitude score of student respondents'

201a	201a	
3b 204	-3b 198	402
99a	99a	
3b 96	-3b 102	198
300	300	600

$$^a f_e = (402 \times 300) / 600; (402 \times 300) / 600; (198 \times 300) / 600; (198 \times 300) / 600$$

$$= 201 \quad ; 201 \quad ; 99 \quad ; 99$$

$$^b f_o - f_e = 204 - 201 \quad ; 198 - 201 \quad ; 99 - 96 \quad ; 102 - 99$$

$$= 3 \quad -3 \quad 3 \quad -3$$

$$b_{f_o-f_e}^2 = 9 \quad ; \quad 9 \quad ; \quad 9 \quad ; \quad 9$$

Cell	f_o	f_e	f_o-f_e	$(f_o-f_e)^2$	$(f_o-f_e)/2f_e$
1	204	201	3	9	0.044776
2	198	201	-3	9	0.044776
3	96	99	-3	9	0.090909
4	102	99	3	9	0.090909
					=0.271370

$$x^2 = \left(\frac{(f_o-f_e)^2}{f_e} \right)$$

$$= \left[(0.044776) + (0.044776) + (0.0909090) + (0.090909) \right]$$

$$x^2 = \underline{0.271370}$$

The expected x^2 value at the 0.05 level of significance is 3.841. Since the computed x^2 value (i.e., 0.271) is less than the expected x^2 value (i.e., 3.841) at the 0.05 level of significance, it is possible to say that it is statistically insignificant.

Appendix 10
Personal profile of the Teacher Respondents

Items	Choices	Teacher respondents	
Sex	Male	10	56%
	Female	8	44%
	Total	18	100%
Qualification Level	10 +2	3	16%
	12+1	4	22%
	12=2 nd round summer course	1	6%
	12=2	10	56%
	Total	18	100%
Total years of service in Teaching	Below 1 year	1	6%
	11-15 years	1	6%
	16-20 years	1	6%
	Above 20 years	15	82%
	Total	18	100%
Experience on Teaching science radio in the primary schools	Below 2 years	5	28%
	2-5 years	6	33%
	6-10 years	6	33%
	Above 10 years	1	6%
	Total	18	100%
Teaching load per week	10-15 periods	1	6%
	16-20 periods	4	22%
	21-25 periods	12	66%
	Above 25 periods	1	6%
	Total	18	100%