ORIGINAL ARTICLE

STUDENTS' PERCEPTION OF MATHEMATICS AND SCIENCE PLASMA LESSONS IN ETHIOPIAN GOVERNMENT HIGH SCHOOLS

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ABSTRACT

The purposes of this study were to disclose some of the issues surrounding the implementation of plasma television program and to investigate the reactions of school level actors- especially students to the nature of the pedagogic reform of the federal ministry of education. The data were collected from 22 high schools in four regional states namely- Oromia, Amhara, SNNPR and Tigray. A self administered questionnaire was filled by 14,080 students. The result of the study revealed that even though the innovation was introduced into secondary schools about four years back, a large number of students did not know the exact share of time given to school teachers for introduction and summary of lessons. It could be possible to argue that given the key role of introduction and the limited time set for teachers to do so, lack of knowledge of teachers' share in this regard would have implication to their extent of use of this time and ultimately on the quality of the lesson understood by the students. Thus in this study it is recommended that effective utilization of time and preparation of modules must be implemented so that students have time to follow the lessons appropriately. Moreover, on regular basis the ministry of education should make appropriate mechanisms for the improvements of the lessons. In addition to this, trainings should be given to high school teachers for maximum utilization of the technology.

Key words: education, plasma TV, mathematics, science, high school

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INTRODUCTION

Ethiopian education has undergone wholesale reform since the introduction of education and training policy in 1994. Along with political, economic and social change introduced at societal level, democratization of the education sector was addressed that calls for system and curriculum change. Pedagogical reform was also made that attempted to change the age-old teacher centered approach into student centered method. These policy frameworks were also used to reform the teacher education sub-system. Teacher education system overhaul, for example, took pedagogical reforms through the introduction of higher diploma program and practicum that reinforced the active learning and student-centered method introduced at the secondary and tertiary education levels.

These reforms definitely brought changes in the role relationship among school actors more specifically teachers and students. Teachers are, therefore, expected to play the role of facilitator and students assume extended role in the process of learning.

A number of rationales were forwarded by policymakers in justifying the importance of ICT in education. Among others, educational technology enables the country's education system align with international development, contributes to the nation demand for trained human power and creates communities that utilize modern system of information**.** Thus, it requires to investigate to what extent these prevalent perceptions were shared by school actors working both within urban and rural areas in various regional states of the country. This study was, therefore, interested to investigate the views of school level actors (the students in specific) taken from larger sample size.

Statement of the problem: Education and training policies and their implementation were becoming contested political issue in contemporary Ethiopia (Inter Africa Group 2004). English language proficiency of students, the use of new technology (Plasma television) in secondary grades becomes some of the sources of contempt among various education stakeholders.

To justify these apparent problems of implementation, since the beginning of the millennium, the Ethiopian government came up with a discourse of 'policy right but the problem is with implementation' (Akalewold, 2005; MOI, 2002). This discourse was aggressively used for some critics for two purposes- to shift the blame for existing implementation problem on school actors and based on this platform, to use it further as a justification for further reforming of the education sector. Though teachers were left to implement the curriculum without sufficient support (for secondary teacher education reform was made after eight years of policy implementation, soon after everything was got worsen), they were blamed for implementation failure. To justify these claims and to establish the need for teacher education reform, the teaching force and existing teacher education program, among other things, were criticized by policy makers as they have lack of the required competence, poor quality of teacher education programs, poor ethical conduct and professional commitment" (MOI ,2002; MOE, 2002b).

The introduction of plasma television was related within this national scenario. Except its sudden appearance in 2004/05 academic year, the overall rationale, the processes that led to its introduction etc., were largely absent within government's policy

documents. In general; the introduction of plasma television was justified by government in response to the critics largely to quality secondary education [where only 40 percent of teachers at this level were qualified to teach (MOE 2005) and to establish common basis to secondary national curriculum where national school leaving certificate examination will be given by making uniform instruction across all regional states] and due to the effects of using mother tongue as a medium of instruction for the entire primary education.

On the other hand, the sudden appearance of plasma television within the national education debate and practice, coupled with the nature of its top-down decision (denying teacher autonomy in making decision as to when and how to teach) has rendered anxiety among members of the teaching force. Together with the series of reform initiatives since the beginning of the millennium (performance based evaluation, the new management guideline etc) within the general understanding held by government that schools and teacher as failed to meet national priorities (MOI, 2002).

To understand recent education policy making (in this case the introduction of plasma television) one needs to go beyond it and look into the politics in contemporary Ethiopia as well. The thesis in this project is to some extent to hear the voices of students.

The purpose of the study is to disclose some of the issue surrounding implementation of plasma television program in secondary grades, and to investigate the reactions of school level actors-students. The need to pick this topic came in response to centrality of the new technology in contemporary education debate.

The general objective of this study was to determine implementation statues of satellite plasma television lessons in Mathematics and Science subjects (Biology, Chemistry and Physics) and to recommend strategies that may address some of the anomalies identified by the study. To this effect, this study has the following specific objectives:

- To examine students attitude to the various aspects of the plasma lesson.
- To investigate the quality of the program content and presentation;
- To examine the roles played by teachers and students in effectively implementing the program;
- To assess the extent to which the learning environment (classroom interaction) is conducive for effective implementation of the satellite plasma television program;
- To identify possible advantages and limitation of the plasma instruction; To investigate potential changes to patterns of usage of the technology among schools, teachers, and students;

Significance of the Study: The current widely accepted approach of education in Ethiopia is to implement student centered learning at all levels of education. At this juncture, investing a huge amount of money for buying plasma television is an indicator for the dedication of the government to improve the teaching-learning process. Hence supporting this new technology, satellite plasma television, is the responsibility of all stakeholders of schools including Teacher Educator Institutions.

The College of Education at Addis Ababa University as one of the stakeholders

should play a leading role in this connection. Therefore, this research will enable the college to play one of its responsibilities of being the center of academic excellence mainly with issues related to the teaching and learning process in secondary schools where its products/trainees will work in the future.

This study will attempt to asses the general picture of issues related to the implementation of satellite plasma television broadcasting in Mathematics and Science lessons in Ethiopia. Therefore, it may provide feedback on the strengths and weaknesses of the program to the concerned bodies. This research may be also useful to overcome the limitations and strengthen the advantages of satellite plasma television. Consequently, it can play a crucial role to create a conducive environment for the teaching and learning process by satellite plasma television. Moreover, the study may be cornerstone for another researcher to conduct similar study deep into the subject specific in singleton.

METHODS AND PROCEDURES

Study design: The main intention of this study was to determine current status of implantation of satellite plasma television broadcast of Mathematics and Science lessons in selected secondary schools in the four regional states of Ethiopia. In order to serve this purpose, a descriptive method of study was employed. The study design of this study is a cross-sectional survey design mainly quantitative approach supported by qualitative through open ended questions developed within the questionnaire where students were the study units.

Sources of Data: Those government secondary schools in Amhara, Oromia, Tigray and Southern Nations and Nationalities Regional States (SNNPR). Sample frame was based on the 2004/2005 Ministry of Education Statistical year (MOE 2005). This study employed both primary and secondary data. Primary data was secured from grade 9-12 mathematics and sciences students in those sampled schools.

Secondary sources include different official and unofficial materials including research work and policy materials at various levels.

Sampling procedure and Sample Size: The population of this research includes all existing government secondary schools mathematics and science students in the above four states, purposively selected sample of five schools each from Amhara, SNNPR and Tigray Regional State and seven schools from Oromia Regional State. Hence, a total of 22 secondary schools were selected as sample schools for this study. Schools were selected purposively based on their experience of establishment and easy to access, mainly along the highway road. Mathematics and science students that participated in this study were also sampled appropriately using systematic random sampling of size 40 students per subject per grade within each school. Grades were used randomly when more than one section were found. Table 1 presents population and sample size of the study.

Table 1: Sampled Regions, Schools and Mathematics and Science Students

No	Regional State	Number of Survey Schools	Number of students
1	Oromia	7	4480
2	Amhara	5	3200
3	Tigray	5	3200
4	SNNP	5	3200
	Total	22	14080

Data Collection Instrument and procedures: The instruments employed to gather necessary data for this study include questionnaire and document analysis. Questionnaire was employed as the major instrument to collect data from students.

Self-administered questionnaire was prepared for students. The items in the questionnaire include background information, the range of instructional variables in terms of pre-broadcasting, during broadcasting and after broadcasting activities. In general, the student questionnaire had 32 items with both open and closed ended items.

In the middle of November an introductory session was given to the data collectors. Between the first weeks of December 2008 a letter of cooperation was written from the College of Education and actual data collection took four months (January-April, 2008). In general about 14080 copies of the questionnaires were distributed to those 22 schools and students identified through the sampling frames.

Survey Response Rate: Out of the 14,080 student questionnaire dispatched in the four regional states about 12,655 (89.88%) of them were recovered properly. Some of the questionnaires were excluded from the analysis since they missed some of the key information for they arrived late after analysis was made.

Method of Data Analysis: Students were given the opportunity to evaluate the success of plasma TV presentation rating the activities an interaction listed by using the parameters such as strongly agree, agree, disagree and strongly disagree and at time with categories like always, mostly, sometimes, rarely and not at all. During analysis some of these categories were combined to provide aggregate picture of respondents' views. For example, to the variable of the study, both strongly agree and agree were combined to indicate positive response where as disagree and strongly disagree were combined and reported as negative responses.

Closed ended items of the questionnaire were encoded using version 14 SPSS-PC software package and basic statistical methods were employed for analysis. The open ended data were analyzed qualitatively by identifying and discussing

related themes along with the quantitative data.

Ethical issues: The consent of all school officials, teachers and involved students was granted supported by an official letter from College of Education, AAU.

For the purpose of this study, data was collected from randomly selected five high schools with the two cycles (grade 9-12) from each of the three regional states (namely Tigray, Amhara and SNNPR) and seven randomly selected high schools from Oromia regional state. A total of 12, 503 students from grade 9-12 were randomly selected.

RESULTS

For the sake of simplicity the result section is categorized into four major areas, namely, background of student respondents, pre-broadcasting of plasma TV, broadcasting phase and after broadcasting phase. In addition, rating parameters like very good and good (very bad and bad), strongly agree and agree(strongly disagree and disagree) are respectively collapsed into their positive and negative senses for easy understanding while treating them in tables and analysis.

Respondents' Background Information

When students were classified across the regional states; 18. 8 percent were from *Tigray*, 26 percent from *Amhara*, 32.3 percent from *Oromia* and 22. 6 percent from *SNNPR* (see **Figure 1**). About 96 percent of students identified their age and the majority of them (92.3 percent) reported that they are between the ages of 14-20. Regarding their sex, 64.7 percent were males and the remaining 35.3 percent were females.

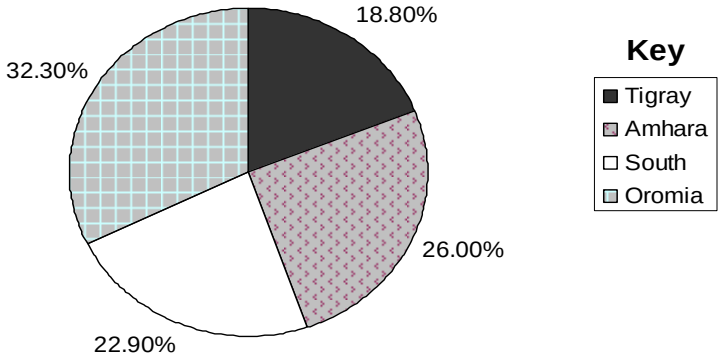

Figure 1. Proportions of Student Respondents by Regional State

From all student respondents, 22.9 percent responded about Mathematics class interaction of plasma TV, 27.4 percent Physics, 26.9 percent Chemistry and 22.8 percent Biology TV classes. The majority of these students (92.3%) were from 14 to 20 years old. In addition, 99.7 percent (12629) of these students responded their grade levels properly.

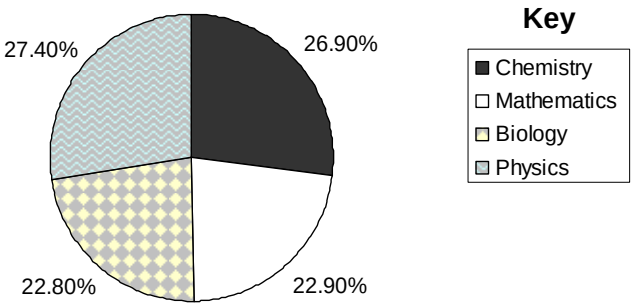

Figure 2. Distribution of respondents by subject areas

Accordingly, about 53 percent belonged to 9th and 10th grades, while the remaining 47 percent were in grades 11th and 12th.

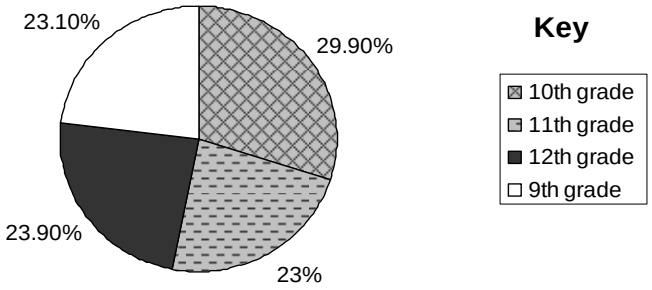

Figure 3: Grade level distribution of students

Pre-Broadcasting of Plasma Lessons

Implementation of the new plasma technology introduced not only differentiation of roles and role relationships between the real human and the televised teachers but also the way these two teachers are related with the students. Specific terms of reference had been issued by the central ministry concerning the roles of each party by dividing the instructional time into pre, during and after broadcasting phases. Under this section, participants were asked about their opinion and the extent of implementation of some of the salient features of the pre-broadcasting phase.

Share of Overall Instructional Time Between the Teacher and the Technology

One of the serious critics made to the plasma technology, based on existing literature, was related to the share of roles and responsibility and the division of instructional time between the classroom and televised teachers. When the technology appeared for the first time in 2004/05 academic year, 30 out of 40 minutes of instructional time were assigned for the televised teachers by leaving only 10 minutes for classroom teachers. Thus, actual lesson presentation was left to the televised teacher all the way from the first lesson up to the end of the year. On the other hand, classroom teachers make use of five minutes each for introducing and summarizing the lesson before and after the broadcasting respectively.

To this end, the first attempt made in this study, as a condition for effective implementation was to check whether research participants had adequate knowledge of the time assigned by the federal ministry for classroom teachers use of lesson introduction. Accordingly, 75.7 percent of student respondents felt that their teacher had at most five minutes. Among these about 4.3 percent said that they had exactly five minutes.

One may simply question the adequacy of two minutes for the execution of these introductory events, especially as teachers change sections. Those respondents who judged the introduction time as inadequate were further asked to suggest what time they think would be sufficient for this purpose. Accordingly; 82.9 percent of students suggested the range between 5-20 minutes and the majority (31.2 percent) of the students suggested that ten mutes would be suffice for the purpose.

Teachers' Level of Interest and Use of Pre-Broadcasting Time

Based on the finding so far, significant percentage of teachers did not adequately knew their share of instructional time and generally consider their share of time as inappropriate. On the other hand, for better use of the technology, teachers were expected to play collaborative role. In **Table 2** below, students were asked to evaluate their teachers' level of interest to use the time set for introduction, clarity of introduction made and overall support they rendered during pre-broadcasting session.

Table-2: Teachers' attitude and levels of use of selected introductory events, as rated by students

Instructional variables	Evaluation (%)		
	Good	satisfactory	Poor
The time given to the teacher to introduce the lesson	28.8	18.5	52.7
Teachers interest to use the time given properly	56	21.1	22.9
Extent of provision of clear introduction by teachers	48.4	23.2	24.4
The extent of support teacher give to TV instruction	55.1	21.7	23.2

As seen from **Table 2** above, 56 percent of the students believed that their teachers made good use of their introductory time. Roughly equal percentage of students rated the case as either satisfactory or poor. Concerning the clarity of introduction made by classroom teachers, 48.4 percent of the students reported as good, while again equal percentage of students rated it as either satisfactory or poor. In spite of the various short comings associated with the innovation, 76.8 percent of students believed that their teachers provide the necessary support.

Frequency of Performing Introduction

Similarly, students were further asked to indicate the extent to which teachers' were punctual and frequency of using introduction time. **Table 3** present students' response to some of the items associated with performance of introduction.

Table-3. Frequency of teachers performing selected introductory events

Rate of teachers performance	Always	Most of the time	Sometimes	Not at all
Frequency of teachers punctuality for lesson	28.9	39.9	28.3	2.7
Frequency of introduction made by teachers	20.5	26.7	37.4	15.1
Frequency of revision of previous lesson	12.7	18.9	46.0	21.7

As indicated in **Table 3**, even if there is no dedicated time to be used by teachers as they change section, 68.8 percent of students revealed that their teachers were punctual either always or most of the time. This shows that teachers were struggling to make the innovation work as most secondary schools in urban areas have more sections and most of the teachers have also heavy teaching loads that make it difficult to be on time for making introduction in another section after finishing lesson summary in the preceding section.

Given the distance between consecutive sections to which teachers were assigned and in the absence of specific time set aside for this purpose, teachers were unrealistically expected to fill the task that can only be done by the central ministry. In spite of such unrealistic demand placed upon teachers, 47.2 percent of student respondents believed that their teachers introduce their lesson most of the time. Generally, the time assigned for introduction did not only consider the range of instructional events that happens during this phase, but also set unnecessary time pressure set upon teachers as if they are omnipresent that may appear within a second to the next section that may be far apart. That was probably why 46 and 21.7 percent of the students reported that teachers' revision of previous lesson as parts of introduction was either done sometimes or not at all respectively.

The Broadcasting Phase

This phase of instruction represents the actual lesson. It was planned to be transmitted centrally from the EMA studio from the 3rd to 33rd minutes of each period of instruction. Under this section, attempt was made to evaluate the planning of plasma lesson and their actual delivery.

The Nature of Plasma TV Lesson and Its Organization

Teaching and learning can be more enhanced if objects and materials are well organized. Here the study identified some of the issues of lesson organization for research participants to make suggestion. Accordingly, the overall skeleton of the lesson- whether any lesson begins with revision of the previous lesson, stating instructional objectives, stating what will be the content and made summary of the lesson. **Table 4** below presents aspects of plasma lesson organization and the response made by the participants.

Table-4. Aspects of Plasma Lesson planning and learning activities as rated by the students

No	Aspects	Agree %	Disagree %	Total No.
	Aspects of lesson planning			
1	It revises the previous lesson	63.6	36.4	11743
2	It clearly states daily instructional objectives	84.7	15.2	11674
3	It clearly states the content of the daily lesson	84.1	15.9	11658
4	It provides a summary of the daily lesson	81	19	11713
5	The lessons are well paced	56.1	43.9	11653
6	The lessons are well organized	81.9	18	11756
7	The lessons are well planned	76.8	23.2	11496
	Aspects of students' activities			
1	It motivates students to learn	67.4	32.6	11524
2	It encourages students to participate	76.9	30.3	11283
3	It clearly communicates to the students	71	29	11632
4	It has no place for visually impaired students	39.5	60.4	11829
5	It has no place for hearing impaired students	57.1	42.9	11382
6	It gives chance for students to discuss in groups	37.4	62.6	11576

As shown in **Table-4,** in all aspects of lesson organization, the plasma program was found to be superior since the majority of both respondents rated them positively, many of the items are more than 80 percent The majority of the respondents agreed with the fact that plasma lessons revise previous lessons (63.6%), state clearly the objectives and content of the lesson(84.1%). In general the plasma lessons were found to be well-planned and well-organized. The variables with the highest percentage of students who disagreed (43.9 percent and 36.4 percent) were whether the plasma lessons are well paced and made revision of previous lessons as part of introducing the new lesson respectively.

Sensitivity of Plasma Lessons to Students' Need

To evaluate plasma lesson in this study, aspects of students' need- its ability to motivate students, access to quality education, its consideration for the special needs of visually and hearing impairment students and the pace of instruction were

identified. **Table 4** identified some of the students' variables to which research participants were asked to indicate their degree of agreement and/ or disagreement.

As shown in **Table 4**, the ability of plasma lesson in motivating and giving equal access to quality education to all students were positively rated by significant proportions of both respondents. It was acknowledged that the variety of information, visual and audio experiences; often beyond the capacity of the classroom teacher to assemble, would sustain students' attention and motivation.

The responsiveness of plasma lessons to students with special need presents different stance. Plasma lessons provide both sound and vision hence marginalizes students with both hearing and sight impairment. Large proportion of students did not believe the fact that visually impaired students were significantly hindered by the technology. For example; only 39.5 percent of the students believed that the technology had no place for the visually impaired students.

Even though a large number of students (71.1 percent) agreed with the official rhetoric that the innovation 'makes students have equal access to quality education' (sensitive strategy from equity perspective to which policy makers are preoccupied), this outcome stood at variance with the various needs of students. According to Temtim (2007), plasma lesson gives attention to visual and auditory oriented students at the expense of kinesthetic ones. Due to the shortage of finance, policymakers took the innovation as panacea with the determinant of laboratory work and other practical activities, thus denying meaningful learning for all; especially the kinesthetic ones.

Relevance of the Content and Task of the Plasma Lesson

Table-5 outlines issues of curriculum relevance and participants' levels of agreement or disagreement on the relevance of plasma lessons

Table 5. Aspects of Plasma Lessons with respect to content relevance and approaches, rated by the students

No	Aspects	Agree %	Disagree %	Total No.
	Issues of content and tasks			
1	The depth of the content is up to the level of students	63.7	36.4	11690
2	The content contains the most important points to be covered	82.3	17.6	11701
3	It gives appropriate class work	72	27.9	11327
4	It gives feedback on class work	66.2	33.8	11619
5	It gives appropriate homework	76	24	11368
6	It gives feedback on homework	50.1	49.9	11268
	Aspects of plasma lesson approach			
1	It cannot replay back	55.3	44.6	11306
2	It gives enough time to do the given class work	36.2	63.8	11659
3	It gives enough time to copy notes	54.1	45.9	11603
4	It makes students have equal access to quality education	71.1	28.9	11517
5	In considers individual differences	75.8	24.2	11599
6	Tracking while the lesson is on progress	68.4	31.6	11450
7	The lesson presented in the neighboring class disturb while the class in progress	38.6	61.4	11603
8	It utilizes a variety of teaching aids	83.6	19.4	11713

Table-6: Relevance of Plasma Lesson Content and Tasks as Reported by Students

As revealed in **Table 5** students were asked to rate the scope and depth of the plasma lesson content. Concerning the depth of plasma lesson content, about 63 percent of students agreed as appropriate. Similarly the content covered by plasma lessons were agreed relevant by significant majority (82.3 percent) of students.

Participatory Approaches Rendered by Plasma Lesson

As depicted in **Table 5**, using the broadcast program for next time depending on the need of schools was perceived not appropriate by 55.3 percent of students.

This specific instance illustrates the issue of power, and how teachers and students were made powerless. Since transmission was managed from the center, the lessons were beyond the control of the school actors. Power interruptions and technical problems were frequent. As a result, instruction was disrupted. Once lessons were not attended (be it technical problem, power failure or being absent due to personal reason) the lessons were passed for good.

The ability of the technology in providing a variety of teaching aid was agreed by 93 percent of students. Though classroom tasks and content of the plasma lessons were considered relevant, about 63.8 percent of students felt that the time set for class work was not appropriate. The

adequacy of the time given for class work and taking notes were disagreed by most participants. Usually the set time for doing exercises were not sufficient, to which students had to risk understanding of the question for writing it.

Definitely the direct instructional approach to media utilization opted by the designers was correlated with 71 and 60.3 percent of students. That was why most participants assumed that the time given for students activities was low. About 62.6 percent of students agreed that plasma lesson does not give sufficient time for students to discuss in group.

About 66.2 percent of students agreed that feedback was given to class tasks. Students were occasionally asked on carryout tasks framed between 20 to 40 seconds, the immediate feedback given to them after the time set discouraged them from attempting the task. After all, it does not matter if students attempt to carryout the tasks or not; the answers will appear on the screen at the end of the allotted time. Feedback to home work was only agreed by 50.1 percent of students.

Benefits of the Technology to Classroom Teachers

The table below(Table 8) shows that the plasma TV introduction assisted the teachers in solving their problems in line with quality, creativity and overload reduction by the rate of about 50 percent as responded by students. But on the contrary, students disagree at the rate of 72 percent that their teachers could have good opportunities to learn teaching techniques from the TV program.

Table 6. Benefits of classroom teachers from the technology, as reported by the students.

No	Aspects of teachers' benefits	Agree	Disagree	Total No. of students
1	Teachers have good opportunity to learn teaching techniques from plasma lessons	28	72	11596
2	It gives enough time to classroom teachers to help students to do class work	72	28	11755
3	It solves the problem of qualified teachers	57.5	42.4	11261
4	It decreases teachers creativity	48.1	51.9	11541
5	It reduce teachers workload	50.1	49.9	11524

Though the actual teaching was made by the plasma TV teacher, classroom teachers were expected to play the role of facilitation. To this fact, about 74.4 percent of students reported that, in most cases, their teachers were available during the transmission. The ministry guideline also identified a number of specific roles for teachers to play while plasma lessons were in progress. While assigning task, the TV teacher also instructs the classroom teacher to check, correct or guide and the time left for this was judged inadequate by 28 percent of the students.

On the other hand, only 57.5 percent of the students agree with the statement that the plasma lessons will solve shortage of qualified teachers. Since the lion's share of instructional time was given to the

technology, about 50.1 percent of students agreed that it decreased teacher work load.

Nature of Audiovisual Provisions of the Plasma TV

Audiovisual materials are well recognized in the teaching learning processes for they maximize learning due to the multiple avenues of sensations they rendered for the learners. Though they are generally taken important, their selection should be made based on criteria. **Table 7** identified such qualities and students were asked to indicate their agreement to the quality of audiovisual provisions rendered by the plasma TV.

Table-7: Quality of Audio Visual Experiences Rendered by the Plasma TV

No	Aspects	Agree	Disagree	Total No.
	Contrast experience			
1	Uses relative sizes of font to give emphasis to important ideas	80.2	19.8	11665
2	Uses upper and lower case letters to make reading easy and fast	75.4.	24.7	11665
3	Uses bold text to emphasize information	85.3	14.7	11716
4	Text and images stand apart from the background and be easily seen	85.1	14.9	11689
5	Uses bright or different colors for emphasis which catch up the attention of the viewers	83.4	16.7	11715
6	Text and colored backgrounds (or background images) contrast to ensure legibility	81.7	18.3	11505
7	It does not use complicated background that make the text difficult to read	77.4	22.6	11418
	Auditory Experience			
1	It is audible for students sitting at the back	89.9	10.1	11444
2	It is easy for students to understand the pronunciation	68	32	11393
3	It is easy for students to understand the meaning	41.4	58.6	11167
4	It has good quality sound that can pay the attention of students	70.4	29.6	11481
	Visual Experience			
1	Provide visual access to experiments that would be difficult for the students to get in their schools	73.7	26.2	11456
2	Present visual information that is difficult to convey in words	76.3	23.7	11429
3	Present visual information which is related to the lives of the learners	67.9	32.1	11271
4	Present visual information in appropriate sequence	75.8	24.2	11222
5	The visual information is presented only when they are needed	76.2	23.8	11339

As shown in **Table-7,** the research participants were asked to rate whether or not the font type and size used, image of font color and contrast between images or font with background color used by the plasma lessons facilitate reading and attention of viewers. The different techniques that were identified for bringing effect on students learning were agreed by students and teachers. The plasma lesson uses relative size and bold fonts for giving emphasis to important ideas; facilitates easy and fast reading of texts by using upper and lower case letters. Similarly the appropriateness of colours used by the plasma lessons was judged by research participants. Thus, the majority of the respondents did agreed that to maximize attention, visibility and legibility of, the plasma lesson uses bright, different color, contrast color and between text/ image background.

As expressed in **Table 7**, the general nature of sound produced by the plasma TV (its audibility and quality) were to some extent agreed by the participants, where as the language aspect was not. The majority of the participants (89.9 percent of them) agreed that lessons were audible even to students who sit at the back. Similarly, 70.4 percent of the students agreed with the good quality of sound.

As shown in **Table 7,** all the experiences identified above were agreed by research the participants. The ability of plasma lessons in providing visual access to experiments that would be difficult for the students to get in their schools was agreed by 73.7 percent of students. In general plasma lessons did provide students access to visual information that was difficult to convey in words, relate visual information to the life of the learners, present them in appropriate sequences and only when they are required.

Activities after the Broadcast

The table below, **Table-8**, all the experiences identified above were agreed by research participants. The ability of plasma lesson in providing visual access to experiments that would be difficult for the students to get in their schools was agreed by 73.7 percent of the students. In general plasma lessons did provide students access with visual information that was difficult to convey in words, relate visual information to the life of the learners, present them in appropriate sequences and only when they are required.

Table-8 Students rating on Selected Classroom Teachers' Attitude and use of Summary after the Broadcast

Instructional variables	**Evaluation (%)**		
	Appropriate	**Satisfactory**	**Poor**
The time given to the teachers to summarize	27.3	16.5	56.1
Interest while summarizing at the end of broadcasting	52.8	21.6	25.7
The way the teacher summarizes the televised lesson	48.7	24.7	36.6

DISCUSSION

Pre-Broadcasting of Plasma Lessons

Share of Overall Instructional Time between the Teacher and the Technology

The instructional innovation was not whole heartedly welcomed by the school communities. According to Temtim (2007) due to teacher's early resistance to the innovation, since the second semester of 2004/05 academic year some nominal adjustment was made to the share of instructional time assigned for classroom teachers by adding two minutes and by reshuffling the relative share of instructional time between introduction and summary of lesson. Thus overall instructional time was pushed by adding two more minutes (to become 42 minutes) and classroom teachers were expected to use only two minutes for introducing the coming lesson and to use the remaining ten minutes for making summary of the televised lesson.

As the adequacy of the time for introduction rated poor by 52.6 percent, the two minutes fixed by the national ministry does not consider the time required for teachers to move from one section to another and such outright omission was attributed to the top-down nature of policy-making that did not consider views of grassroots actors. A number of findings also revealed that with such time share teachers can do noting more meaningful than acting like operator- opening and closing the television (Getnet 2008; Brook 2007; Kasssahun etal 2006.).

One would question the wisdom of policymakers in authoritatively assigning only two minutes for teachers to introduce the focus of the televised lesson without taking into account its pedagogical requirements. In this respect, Gigne and Briggs (in Borich 1988) argued that to bring about tight relationship between teaching and learning, teachers need to follow the sequence of seven instructional events. Out of these, the first three instructional events namely getting attention, informing the learner about the objective and stimulating recall of prerequisite learning were identified as preliminary instructional events that need to be attended before the actual presentation of the lesson.

According to the above authors, without the students' attention nothing in the lesson will be learned, let alone actively engage them in the learning process. Once the internal processes of learning were activated in ways that correspond to the content to be presented, the channel on which the lesson will be transmitted should be given and the most effective way of focusing learners' receptivity was to inform them the complexity of the behavioral outcomes they are expected to attain by the end of the lesson. Finally, since learning cannot occur in a vacuum, the necessary task-relevant prior information must be retrieved and made it ready for use (Borich 1988).

The Nature of Plasma TV Lesson and Its Organization

Careful planning is absolutely essential for effective teaching. It helps to produce well-organized classes, purposeful class atmosphere and reduce the likelihood of disciplinary problems (Callahan & Clark 1982). According to Borich (1988), the important process of planning begins with implementing the five inputs: knowledge of aims and goals, knowledge of learners, knowledge of subject matter content and its organization, knowledge of teaching method and tacit knowledge acquired from day to day experience in the classroom.

According to some studies (e. g, Temtim 2007) the innovation was generally technocratic in its approach and the process was attended without the participation of students and teachers. For example; the learning pace, language ability etc., of students were not taken into consideration and many of the difficulties visible since its implementation were evidence for the marginalization of the actual actors. Thus another way of uncovering the responsiveness of the plasma lesson was by asking participants to some of the issues of planning and to what extent attention was paid to them. Thus aspects of lesson organization, needs of students and teachers, relevance of the content and tasks of the lessons etc. were considered for examination.

As all of the planning and organizing activities are rated greater than 50 percent, most of them at least 80 percent, this apparent fact seems sensible; based on experience of these researchers as teacher educators with experience in school practicum, not due to their omissions in the plasma lessons as such but due to the way the program was implemented. This state of apathy was compounded with teachers' coming to class late as they try to finish summary of the preceding lesson and then manage to change to another section. As a result, students were mostly left alone and a state of chaos reigned in the classroom. This was why one-third of students since they missed the very important topic for understanding.

Sensitivity of Plasma Lessons to Students' Need

Success of the teaching learning process depends largely on how it fitted to the students' abilities, needs, aptitude, interest and goals (Callahan & Clark 1982).

Students who are well motivated to learn usually do learn if lessons are reasonably well designed. On the other hand, if students' attitude towards school and school learning were antagonistic, teachers' effort alone did not likely to be fruitful. In addition to these psychological findings, there are also research results by communicating experts who uphold the important role the audience have in determining the effect of communication (Amare 1998; Ali 2005).

This finding seems reasonable; in light of recent findings that generally rated plasma lesson instruction as teacher-centered where more concern was laid to content coverage (Brook 2006) that makes students with sight impairment at relatively advantageous position that students with hearing impairment who could not access the spoken medium for it was not supported with sign language. This fact was agreed by students.

In this scenario, one could do nothing but question whose quality and whose perspective was right? How can then one judge the innovation adequately as quality input to all students while at the same time the various needs of students were not seriously taken into account? Could quality of education be measured in terms of provisions of standardized curriculum to all students irrespective of the unique contextual differences of secondary schools and students? The authoritative statement in the government's rhetoric seemed to be based on policymakers perspectives and not of school actors [especially that of teachers] since the innovation tends to serve more of the government's concerns (Brook 2006). A single phrase that all earlier studies on the subject unanimously agreed was the fast pace of plasma instruction (Gary 2005; Ali 2005; Brook 2006; Getnet 2008; Temtim 2007;

Kassahun et al. 2006). Though schools had now three years experience with the innovation, still 43.9 percent of students believed that the pace of plasma instruction was not appropriate to their level.

Relevance of the Content and Task of the Plasma Lesson

Subject contents are the substance of teaching. Teachers are expected to select contents that seem most likely important to students. Such principle, according to Callahan & Clark (1982) was refereed as the doctrine of contingent value. Such principle implies that thorough coverage is the most important, useful content was more desirable than covering everything superficial.

Though the relevance of school curriculum had long been the focus of considerable debate, it was now used to give credibility to the plasma lesson. The ministry further argued that it followed exactly what was identified in the national curriculum, though it was labeled as 'vastly overcrowded' (Tewodros 2006), specific instances were mentioned by several researchers to indicate the problem of relevance (Gary 2005; Ali 2005; Brook 2006; Tewodros 2006). According to Gary (2005) in physics lesson, students see more of Johannesburg upper class suburbs and supermarkets than they do scenes from Ethiopian life. The plasma presents 'rich content but it is not selective' (Tewodros 2006). The appropriateness of the class work and homework tasks of the plasma lessons were also agreed by students.

Based on available findings, there is a different interpretation to such mainstream perspective, one seemingly concerns for policymakers was related to content coverage. Before the introduction of plasma lessons, it was argued that most teachers did not manage to finish the content of their subjects, for most part due to the scope of secondary school curriculum. Thus, when content coverage was singled out without referring to other important competing outcomes to which professional educators' weight, then it is indeed a success, but what if understanding was valued equally or above that of mere content coverage?

One may also need to ask a similar question to understand fully how plasma lessons manage to finish a nationally prescribed curriculum to which it was impossible to cover by some classroom teachers. Based on existing findings, this concern of policymakers was addressed through the evaluation of content coverage at the expense of students understanding and their meaningful participation. The various instructional strategies employed by the plasma mode of instruction to attain such purpose were done at the expense of students' direct needs, These include the pace of instruction which was too fast, its direct instruction approach, too little time given to students' participation, absence to the time for students problem and no feedback from the plasma teacher.

For example: one sound pedagogical implication was to adjust instruction to the need of students, In the case of plasma lesson, what were done was to the opposite. Hence, instead of adjusting instruction to the various needs of students, students were demanded to adjust themselves to the demands of the plasma lesson.

Classroom teachers are, thus, successful in letting students learn and understand those limited portions and their failure in finishing the nationally prescribed curriculum was attributed to the pace of students learning. From these two

competing demands, and based on existing data and interpretations, classroom teacher held themselves responsible to their students' learning rather than policymakers' intention of coverage.

Participatory Approaches Rendered by Plasma Lesson

A number of arguments were forwarded by policymakers for justifying the importance of satellite education television program. For example; the new technology was believed to change the teaching culture, in Ethiopian context it was criticized for being dependent on largely on teacher verbalism.

In this regard, the introduction of plasma lesson was not considered as innovative since direct instructional mode prevailed, a transition from teacher centeredness to plasma centeredness (Gary 2005; Ali 2005; Getnet 2008; Temtim 2007). **Table 7** outlined some of the participatory possibilities rendered inherent in the nature of the technology and major policy rhetorics were outlined about which research participants were asked to rate these items based on their level of agreement and/ or disagreement.

Despite the fact that students learn in a stressful situation (fast pace, inability to take note, difficulty with language etc) such skipping of lessons would further widen the gap in students learning and making teachers work uncertain with what topic to prepare for the class. The non-repeatable and non-rewindable nature of the lesson means lack of control over the transmission that attributes a general feeling of helplessness (Brook 2006; Ali 2005; Getnet 2008; Kassahun and Zelalem).

Benefits of the Technology to Classroom Teachers

The Ministry rhetoric also includes the benefits the technology to classroom teachers. One of the salient argument set forward was related to lack of adequate

quantity of competent teaching force. In addition to the existence of ill-qualified teachers, most of those who are currently teaching are beyond their capacity. Thus, the technology could present component teachers to all students of the nation, irrespectively of the location of the schools. Plasma lessons provide best teachers that help school teachers to learn not only the language, but also the method of teaching. **Table-8** outlines some of such claims to which students were asked to indicate their level of agreement.

The plasma TV teachers were considered as qualified and experienced in the ministry rhetoric, though observation by a number of researchers revealed the opposite. For example, Tekeste (2006) labeled them as 'readers' and not teachers. More probably, they were recruited for their language proficiency, hence, instead of teaching they read out the lesson to the detriment of the students. This was why about 72 percent of students disagreed that the plasma lesson gave them opportunity to learn various teaching methods. The majority of the students consider the new innovation does not have much worth to teach teachers about methodology.

As it is revealed from the finding, about 50% of students believed that the implementation of satellite plasma television lesson would solve the problem of qualified teachers scarcity and reduction of their workload. The technology deprived teachers from making instructional decisions to which they used to have (Ali 2005; Getnet 2008). The cumulative effect

of this was gradual distancing from their profession and with the resultant atrophy of their intellectual capability. This fact was further reinforced for about 48.1 percent of students believed that the technology would decrease teachers' creatively.

Nature of Audiovisual Provisions of the Plasma TV

On the other hand, the pronunciations of plasma presenters and students understanding were not accepted by significant majority of the respondents. For instance, only 68 percent of students agreed that students easily understand the pronunciation of lesson presenters. Since the TV lessons were designed in South Africa, many of the presenters were foreigners with a difficult slung [standard English]. This same concern was raised by Brook (2006) when he questioned why Ethiopians were not used at least for lesson presentation.

Activities After the Broadcast

When the plasma lesson was over, teachers were generally expected to give overall summary of the program. Teachers need to identify and discuss aspects of the lesson that may present challenge to students and any queries from them. Finally the teacher was expected to introduce the title and content of the next televised program.

The relatively extended time given for teachers' summary was judged as low probably due to the emphasis plasma lessons on the principles of content coverage. The relatively larger portion covered by each plasma lessons during those thirty minutes might contribute to difficulty for teacher for making summary of the lessons within ten minutes.

Conclusion and Recommendation

Based on the analysis of the findings identified so far, this study draws the following conclusions:

Even though the innovation was introduced to secondary schools four years back, significant percent of students did not know the exact share of time given to school teachers for making introduction and summary of lessons. It could be possible to argue that given the key role of introduction and the limited time set for teachers to do so, lack of knowledge of teachers share in these regard would have implication to their extent of use of this time and ultimately on the quality of the lesson understood by students.

The time assigned for classroom teachers' pre-broadcasting session was inadequate and it did not consider the range of introductory events that could happen during instruction. As a result, significant percent of teachers did not make use of their time, not punctual and could not make appropriate introduction.

Significant percent of respondents argued that the time share for introduction should be elevated from the current two minute to the range between 5-10 minutes.

In general, plasma lessons were found to be well-planned and well-organized. Nearly the entire introductory variables were supported except questioning the appropriateness of their pace of instruction. Most of the variables identified in relation to students' need were agreed except for students with special needs. Due to the variety of information, plasma lessons were found to be motivating. Generally, they communicate information directly to students and other forms of knowledge construction like group discussion was totally absent. In general, the content

covered by the plasma lesson was relevant and did attend to secondary students' level of understanding. Similarly, class work and homework tasks were appropriate even though the feedback were found to be insufficient.

Concerning the nature of the technology itself; along with the problem of pace, the inability of the plasma lessons to replay back, their variance to individual difference were some of the serious problems. In general, even though plasma lessons uses a variety of teaching materials, provide quality education for all students in the schools nation wide, like the pre-broadcasting the time assigned for class work and for copying notes were not considered appropriately.

This fact indicates that even after three years of implementing the innovation, significant number of participants lack knowledge about the time share. This may have serious implication; especially for teachers, for it affects their level of use of the time and ultimately to the difficulty of understanding the lesson by students.

As suggested in the study, improvements must be made to alleviate the problems.

1. Enough time should be given for teachers and students to do their jobs properly and for the success of the teaching-learning. The time
2. given for the plasma teacher and the class room teacher should be revised.
3. Schools should have the whole programs so that they can use it whenever a need arises.
4. The plasma has to give time for teachers to give tests, quizzes and assignments.
5. Students and teachers have to get modules so that they will prepare before classes and this helps them to get enough time to attend the plasma lessons.
6. Guidelines should be available in schools for reference.
7. Schools have to have automatic generators for replacement whenever electricity power fails.
8. The schools should prepare additional classes to help students.

ACKNOWLEDGEMENT

We are grateful to our supporters; SIDA-SAREC for fully supporting the fund to complete the study via Addis Ababa University, College of Education our sponsors and facilitators all the way throughout. We would also like to extend our thanks to students and school authorities who participated in the study and gave us their assistants during the data collection.

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