ASPECTS OF PLASMA TELEVISION SUPPORTED LEARNING IN MATHEMATICS CLASSES IN SELECTED ETHIOPIAN HIGH SCHOOLS

Kassahun Melesse Tegegne
Zelalem Teshome Wale

ABSTRACT:
The purpose of this study was to examine the aspects of mathematics learning via Plasma TV based on the perceptions of students and teachers in Ethiopian high schools in selected four regional states. The design of this study was cross-sectional following quantitative approach. A set of questionnaires was administered on high school mathematics teachers and students followed by descriptive analysis. The result of this study shows that students and teachers agreed in most of the merits and challenges of PTV lessons and activities. Both parties agreed that the lessons are well organized and well planned. Majority of them agreed that the plasma lesson motivates students to learn and encourages them to participate. One of the drawbacks both parties agreed was the time allotted to teachers to introduce and consolidate the lessons, and students to do class work and take notes was not enough which are essential elements mathematics classes. The major recommendations of this study are then to revise the overall PTV delivery system, emphasis on scheduling in such a way that mathematics teachers could have sufficient time and space to help students improve their problem solving skills and fill in the gaps that the technology cannot handle.
INTRODUCTION:

Along other societal sector like political, economical and social changes, transformation of the education sector in Ethiopia was addressed that calls for system and curriculum change, introducing a new education and training policy in 1994 (TGE, 1994). The reform was made pedagogically to address the change of the age-old teacher centered approach into student centered method. These policy frameworks brought a reform to the teacher education sub-system by introducing teacher education system overhaul (TESO), the introduction of higher diploma program (HDP) and practicum that reinforced the active learning and student centered method introduced at the secondary education, and the technological input, the high school learning supported by plasma TV broadcasting system (MOE, 2003). These reforms definitely revolutionize to bring change in the roles and relationships among school actors more specifically Mathematics teachers and students. Mathematics teachers are therefore expected to play the major role of coaching in support of students’ learning. In light of these developments, introduction of direct satellite televised education program since 2004-2005 academic year in government secondary schools was perceived differently by various stakeholders in education.

Though ICT in Ethiopia is still in its infancy level, it has developed very fast in recent years. In part this was due to the recognition of the vital importance of ICT in the development process worldwide. For this, the Government has been undertaking several strategic policy initiatives that promote its development through the Public Sector Capacity Building Program (PSCAP) that represents an integrative national and sector-wide approach to capacity building. In this line the Ethiopian Government has made the development of information and communications technology (ICT) one of its strategic
priorities. The policy framework stems from the recognition that ICT was the key driver and facilitator for transforming Ethiopia’s predominantly subsistence-agriculture economy and society into an information and knowledge-based economy and society by effectively integrating into the global economy. Overall vision of the national ICT policy was to transform Ethiopia from a poverty-stricken country into a middle-income economic society with a deep-rooted participatory democracy and good governance based on the mutual aspiration of its peoples. In order for Ethiopia to move into the knowledge and information age, and be integrated into the global economy, there is a need to vastly expand educational opportunities, modernize the educational system and improve its quality so that professional human power could easily be supplied.

Consequently, the country invested considerably on satellite education television programs to enhance it accessibility, quality and equity of education to the mass population. Such huge investment was believed by the Ethiopian government as relevant and mandatory due of the role ICT plays in national development in this time of globalization. In general adopting such technology alone will not contribute to development and requires the need for every actors to use it adequately for the purpose it was intended. Here, as major agents of learning the commitment and conviction of teachers and students during implementing ICT support learning is very essential. In order for this innovation serves its purposes, students and teachers need to understand and play their roles and responsibilities.

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 create communities that
utilize modern system of information. Ethiopia started satellite education television program in Mathematics, Biology, Chemistry, Civics and Ethical Education, English and Physics in government secondary Schools during 2004/05 academic year with around 7000 plasma screens. To address existing quality and equity aspects and to resolve problems of limited access and using lessons from experiences of other nations, the ministry of education designed televised education program having 30 minute duration each. Along with other sciences, satellite television program in Mathematics now given to secondary schools was based on national curriculum. The written scripts for the programs were made based on identifying content specification through consulting formal education flowcharts, syllabi and teaching learning materials from grade 9-12.

Like the other five programs, Mathematics was designed to last for 30 minutes. It is transmitted based on broadcast time table in eight channels where the subject was repeated five times a day. Satellite television program broadcasting starts each day from 2:02 till 11:40 local time for a total of 9 hour and 38 minutes and with a total of 90 programs in week. These programs were also transmitted daily for evening students and in Saturday morning for grade 9 and 10 students.

**Statement of the problem:**

The sudden appearance of using 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; MOE 2002b), send effective message to teachers that the use of technology was meant to replace them altogether. Even though; the reaction of students, parents and teachers were well-felt, their voices in this regard were not well represented in a systematic educational enquiry.

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 programs, among other things, were criticized by policy makers as they “lack the required competence, poor quality of teacher education programs, poor ethical conduct and professional commitment” (MOI 2002; MOE 2002a).

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 were justified by government in response to the critics largely to quality of secondary education. However George Piranian (1975) urges the mathematical community to strengthen its pedagogical effort, not by buying new gadgets, not by creating new committees of experts, by the intensification of personal effort. Let each man assume the responsibility for teaching with greater vitality.

Due to the very nature mathematical content that concentrates of abstract concepts and problem solving skills, it was believed that using televised programs as an input would enhances for quality learning to occur. Thus using the technology
would make it possible to design different effects, animation, graphics and pictures and for designing individualized and group activities. This was why Mathematics subject was given priority for using the technology as an input for designing quality television programs that will be accessible to all schools. This study therefore, attempts to investigate the aspects this newly implemented technology in support of educational system assumed as one of the recent innovation in Ethiopian secondary schools. The purpose of the study is to disclose some of the issue surrounding implementation of plasma television (PTV) program in Mathematics Subject in secondary grades, and to investigate the reactions of school level actors-students and teachers, and compare their reactions, commitments and readiness towards this program, and assess the merits and demerits of the new facility in line with the challenges to be resolved.

This study is assumed to be relevant in preparation for higher education learners and the curriculum development for secondary schools, including satellite plasma television broadcasting system which is a new trend in Ethiopia. As a result, the study is expected to improve the system of implementation through overcoming the challenges identified either change in program planning and/or methodological modification in training high school teachers. It also assumed to assist the policy makers indicating areas of improvement for future progress assisting the policy makers during revision. It may also provide feedback on the strengths and weaknesses of the program to the concerned bodies so that to be able to overcome the limitations and strengthen the advantages of satellite plasma television. Beyond all, the study may be cornerstone for another researcher to conduct similar study.
RESEARCH METHODOLOGY:
Research Design and Population:
The design of this study was cross-sectional mainly following quantitative approach supported by qualitative through questionnaires focused on the current status of implantation of satellite plasma television broadcast in Mathematics classes in selected secondary schools of four regional states of Ethiopia, Oromia, Amhara, Southern Nation & Nationality Peoples Regional States (SNNPR) and Tigray. The study units of this study were mainly teachers and students. In order to serve this purpose, different types of descriptive method were employed associating the experience and views of the two actors; students and teachers through causal comparative studies. Those government secondary schools (grades 9-12) in the above four regional states were in the sample frame based on the 2004/2005 Ministry of Education Statistical year (MOE 2006).

Sampling Procedure and Sample Size:
The population of this research includes all existing government secondary schools in the above four states, a purposive sample of five schools each from Amhara, SNNPR and Tigray Region Regional State and seven schools from Oromia Regional State, hence, a total of 22 secondary schools were selected as sample schools for this study. These schools were selected purposively based road accessibility, financially economical and rich in their experience and large in their expansion and facilities.

Teachers and students that participated in this study were also sampled appropriately. All existing subject teachers (On average 5 teachers per school) of Mathematics were involved. Systematic random sampling was used to choose 40 students per subject per grade within each school. Accordingly, 110 teachers were expected all in all of which 35 from Oromia and 25 each
from the rest three regions. Similarly, 3520 students were expected from the four regions in which 1120 from Oromia and 800 each from the other three. From this sample size the survey response was 2860 students and 124 teachers (more than the expected), which were returned properly. Besides, some questionnaires were excluded from the analysis since they missed some of the key information.

**Instrument Development and Administration:**

The instruments employed to gather necessary data for this study includes questionnaire and documentation. Questionnaires were employed as the major instrument to collect data from teachers and students. Here, though observation would have been wise to use as one of the tools for data collection it was not employed due to large number of classes which would be one limitation of the study. The instruments were tested in the local areas after three senior researchers critically commented upon it for further improvement.

In general two sets of questionnaire were employed for students and teachers. The items in both questionnaires include background information, the range of instructional variable in terms of pre-broadcasting, during broadcasting and after broadcasting; having about 32 to 37 items with both open and closed ended questions.

Concerning data collection procedures, introductory sessions were given to the data collectors in each study area and the actual data collection took four months (January-April, 2008) which was supported by official letter from College of Education of AAU. In general, about 2984 questionnaires were distributed to those 22 schools, for teachers and students identified through the sampling frames based on the consent of the respondents.
Method of Data Analysis:

The analysis is mainly based on descriptive combining some positive parameters like strongly agree and agree on one hand and the negatives like strongly disagree and disagree on the other so that the aggregate could provide general picture of respondents’ views. Closed ended items of the questionnaire were encoded using version 14 SPSS-PC software package and basic statistical methods were employed for analysis.

ANALYSIS AND DISCUSSION:
Respondents’ Background Information:

In this study a total of 2984 participants were involved, out of which 2860 were students and the remaining 124 were teachers. Of these Mathematics students’ respondents, 2769 of them indicated their sex of which 63.2% were males and the rest 36.8% females. Looking into the regional origins of student respondents 31.4 % were from Amhara, 30% from Oromia, 24.2 % from SNNPR and 14.4% from Tigray. Of these 2696 students who identified their age 74.4% were in the range of their proper age (15-18) while 20.1% were over aged and 5.2% under aged. From 2859 students who responded for their grade levels, 25.5% were found in grade 9 while 26.4% in grade 10, 23.3% in 11th grade and 24.8% in 12th grade.

Among a total of 123 school teachers who indicated their sex 95.9% were males while 4.1% were females. Majority of the mathematics teachers (62.3%) were found young, their age ranging from 21 to 39. Of these 122 mathematics teachers, 37.7% of them were of age below 30, 24.6% of age between 30 and 39 inclusive, 33.6% from 40 to 49 and the rest 4.1% were 50 and above years old. Among a total of 124 teachers who were involved in the study 24.2% were from Tigray, 32.3% from Amhara, 23.4% from Oromia and 20.2% from southern nations and Nationalities (SNNPR).
The academic status of the majority of these mathematics teachers were at the level of first degree (86.8%) in which 11.6% were at diploma level and only 1.6% at second degree level. The teaching experience of these teachers ranged from 1 to 35 years of service. Majority of the mathematics teachers (35.8%) served for 20 years and above, and 25.9% of them between 10 and 19 years; 18.3% from 5 to 9 followed by 20% serving below 5 years. In addition, majority of the teachers (63.7%) found teaching 10th grades while 28.2% teaching in 12th grades.

The working load of the teachers run from 5 to 30 hours per week; majority of them handling 20 hours (30.6%) and 25hrs (32.2%), only 9% in between. Apparently, teachers were asked to show experience of the average student number in their classes which ranged from 45 to 100 students per class. Many (46.3%) of the class were handling more than 70 students in a class and only 12.2% of them experienced the normal class size 50 students and below.

**Learning Activities During PTV Lessons**

In general, there are two widely used methods of presenting educational televised programs—enrichment and as instructional. From these methods, the country adopted instructional or direct teaching approach in the new satellite programs. Enrichment model of media utilization was considered not responsive to the county’s existing educational problems. It was assumed that enrichment does not give practical solution to existing problems like shortage of teachers, problem related to teachers teaching competence, shortage of teaching-learning materials and lack of awareness among teachers about the importance of ICT.

The satellite educational television program that was introduced quite recently attempted to address existing limitations and facilitate students understanding of concepts through the use
of pictures and graphics. It presents formulae and complex principles through animation techniques. It also helps students and address problem of equity and delivery of the subject to all students in urban and rural areas. It further contributes to cover course materials that were not, most often, completed by the teacher within the academic year. The relevance of ICT for Ethiopia’s attempt to provide access to education was recognized that it contributes significantly to enhance teachers teaching competence by introducing them in a continuous and sustained manner with new information and methods of teaching. Due to the close link between pedagogy and developments in science and technology, transitions were made from verbal teaching to the use of textbooks, then use of radio and television. Today it is possible to provide education through satellite educational television program and using the computers and the internet. Nevertheless, until the introduction of this plasma TV teaching, teachers in Ethiopia, until quite recently, provide their lessons without any assistance; teachers perform the teaching learning process without the help of technological teaching aids.

Still other advantage of this technology to schools includes the ability of the technology to make available relevant educational information to all stakeholder in equitable and speedy way; its ability to minimize the impact of lack of educational facilities and teaching aids between secondary schools in urban and rural; enabling students to find other sources of information besides the classroom teacher and above all provides common and standardized educational experiences to all students and provides support to most existing teachers who teaches beyond their levels of training.

Thus, school teachers, teacher educators and even teacher education institutions were blamed requiring the need to fix through prescribing wholesale re-visitation of teacher education
called TESO (Teacher Education System Overhaul) and through the introduction of plasma television (MOE, 2003). Thus, by introducing televised instruction the teaching force was disempowered through the provision of teacher proof lesson. Teachers complete control over their classroom was systematically taken by the new media and their role was assumed down-graded to only caregiver (as supervising students behavior and manipulate the TV monitor) while the televised actual teacher teaches.

Coming to the study to be specific, as explained in the discussion of respondents’ background information, teachers’ profile indicated that the majority of sampled teachers had appropriate qualification and experience though majority of them teach in overcrowded settings. With this general background information of respondents, the paper then treats some aspects of the pre-broadcasting, broadcasting and post broadcasting phases of plasma lessons. Under these sections, participants were asked about their opinion and the extent of implementation of some of the salient features of the broadcasting phases.

**Aspects Before Plasma TV Lessons:**

Teaching and learning process was generally dependent on adequate planning, otherwise would fail to attain its purpose. In order to conduct the relevant task; teachers would need to prepare their educational plan in advance. Thus, teachers are expected to know in advance the topic of their daily lesson, prepare daily lesson plan, made preparation adequately by consulting the portion in the textbook to which that day program emphasizes, arrange the inputs identified in teachers guide and inform students in advance those educational materials and facilities required during the broadcasting of programs. Finally, they are expected to make a brief introduction about the daily televised lesson by
concentrating on the title, specific objectives and content of the program.

Though what students are supposed to do in each program lesson was identified in the student-guide, due to financial reasons these guides are not available in schools. To minimize these effects, teachers were expected to inform students what they should do/bring for the next lesson until such times comes where all schools are connected through internet and the students may access the database and prepare accordingly by using computers.

Before the broadcast, students are expected to prepare by reading those relevant pages from their textbooks and other references and come with some understanding of the topic of the daily lesson. They are also expected to avail their notebooks, pen, and pencil and depending on the topic under consideration they should bring rulers, calculators, compass, protractor and other facilities in particular to the subject mathematics. Students are also expected to listen attentively and reflect when appropriate to their teacher introductory explanations and execute what they are expected to do.

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 for 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. 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 the 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 which is mostly wasted during rounding from section to section. According to P.R. Halmos (1980), as teachers in classrooms we will emphasize on problems more and more, and that we will train our students to be better problem-posers and problem solvers than we are.

Out of 2768 student respondents, majority of them (70.7%) evaluated the frequency of the mathematics teachers’ punctuality always (31.4%) and most of the time (39.3%). Students were asked to reveal their experiences about the minutes the school teachers have had for the introduction, before the TV lesson started. For this issue, 2333 students responded and as a result, majority of them (83%) at most 5 minutes (45%) said 5 minutes while 38.1% below 5) in which 18.6% said zero and 15.3% said only 2 minutes. In this line, 80.9% of the teachers said that at most 2 minutes were given for this session while 13.9% of them said that they have 5 minutes.

Following the above issue students were asked to evaluate the time given for introduction by using the parameters; very good, good, satisfactory, low and very low. Out of the 2757 who responded for this issue saying low (27.7%) and very low (25%) which was 52.7% below satisfactory in aggregate. As a result, 66.2% of teachers said that the time given for introduction is poor. Furthermore, majority of student respondents (47.2%) revealed
that their teachers introduce always (20.7%) or most of the time (26.5%) with in this short period of time.

In addition, majority of those students who said the introduction time given to the school teacher was low suggested that 10 minutes (31.7%) would be sufficient while 18.8% said 15 minutes. In general, 68.9% of the students suggested the introduction time to be ranged from 10 to 20 minutes which could be questionable for a period of 42 minutes. Though the time given was not sufficient, 47.3% of the students said that their teachers introduce the lesson clearly rating good whereas 27.3% rated weak. In this same issue, many of the teachers (81%) who indicated the time given for the introduction is poor further suggested from 5 to 10 minutes in which the highest was for 5 minutes (55.7%) and then 10 minutes (21.5%).

On the other hand, 57.4% of the teachers did not have the teachers guide for PTV lesson so that they could be prepared before hand, where as 81.7% did have the objectives of the program to be aired next class. Besides, 44.7% of the teachers did often tell their students about the next lesson at the rate of always (20.3%) and most of the time (24.4%). Majority of the teachers (40.7%) used to do this activity some times. A great deal of teachers (76.7%) confirmed that the students own text books at individual basis. Nevertheless, 54.5% of the teachers said that the books did not reach the students as soon as the first class begins and 95.7% of them also said that the books reach the students within a month or two. After all these ups and downs, 83.7% of the teachers complained that students did not usually bring the texts to classes which affected the introduction as well as the activity sessions of the lesson even if they owned it.

**Aspects During PTV Lessons**

In general, the MOE/EMA believes that satellite television program was designed to help classroom teachers. Even though
the technology accomplish task that cannot be performed by the teacher, they are expected to guide, identify and give support students, take note of issues that are difficult to them and also consult students while they solve exercises suggested by televised teachers. It was further argued that if the teacher made adequate preparation in advance; respond to students response to the questions posed by televised teacher and made sure that all tasks given to students were dully exercised; he/she could address all possible limitations of the technology.

As a result, during broadcasting, teachers are expected to have their textbook with them so that if broadcast failure happens should take over the teaching learning process. The teacher is expected to follow and provide help to students. Teachers should entertain students’ questions, give comment, take note of those issues that he/she believed require further explanation and do not interfere while the televised teacher is conducting lesson.

Similarly, students are not expected to write all the materials that appear in the screen since the televised program closely follows what were in the students’ textbooks. Instead they should read and take short note of those issues that they believe requires further discussion or explanation after transmission was over. To this end, students are expected to follow attentively the program, present to classroom teachers their answer made to questions posed by the televised teacher and do classroom tasks and take note of the core issues of the lesson.

Careful planning is absolutely essential for effective teaching. It helps produce well-organized classes, purposeful class atmosphere and reduce the likelihood of disciplinary problems (Callahan & Clark 1982). As teachers in mathematics classrooms we will emphasize on problems more and more, and P.R. Halmos (1980) stated that we will train our students to be better problem- posers and problem solvers than we are.
According to some studies, for example Kassahun & Zelalem (2006), the innovation does not consider individual differences, learning pace of students and their language ability which contradicts with the fact that the best way for an individual to learn is to rediscover them for himself (P.R. Halmos, 1994). Thus another way 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. The table below presents aspects of plasma lesson organization and the response made by the participants, in line with the perception of the two parties, students and teachers.

**Table-1: Aspects of Lesson Planning of Plasma Lessons, as Reported by Students and Teachers**

<table>
<thead>
<tr>
<th>No</th>
<th>Aspects of lesson planning</th>
<th>Agree (%)</th>
<th>Disagree (%)</th>
<th>Total No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Stud</td>
<td>Teach</td>
<td>Stud</td>
</tr>
<tr>
<td>1</td>
<td>It revises the previous lesson</td>
<td>62.1</td>
<td>88.4</td>
<td>37.9</td>
</tr>
<tr>
<td>2</td>
<td>It clearly states daily instructional objectives</td>
<td>85.2</td>
<td>81.8</td>
<td>14.8</td>
</tr>
<tr>
<td>3</td>
<td>It clearly states the content of daily lesson</td>
<td>83.7</td>
<td>93.4</td>
<td>16.3</td>
</tr>
<tr>
<td>4</td>
<td>The lessons are well paced/speed</td>
<td>52.9</td>
<td>79.1</td>
<td>47.1</td>
</tr>
<tr>
<td>5</td>
<td>The lessons are well organized</td>
<td>81.2</td>
<td>88.6</td>
<td>18.8</td>
</tr>
<tr>
<td>6</td>
<td>The lessons are well planned</td>
<td>77.0</td>
<td>89.1</td>
<td>23.0</td>
</tr>
</tbody>
</table>
As shown in Table-1 in all aspects of lesson organization, the plasma program was found to be superior since the majority of both respondents rated them positively (more than 80% in many cases). In most of the cases, the proportion of teachers who agreed with the lesson organization issue was found to be greater than that of students. The majority of respondents agreed with the fact that clearly stating the objectives and content of the lesson. Moreover, the plasma lessons were found to be well-planned and well-organized. The variables with the highest percentage of students who disagreed (47.1%) was whether the plasma lesson were well paced during presentations showing students had difficulties in coping up to its speed. In addition 37.9% of students disagreed that the plasma revises the previous lesson which serves as a bridge to understand today’s lesson.

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. Presently, plasma lessons are no more sources of inspiration to students as too often stated in official rhetoric. The majority of students just exhausted with the mandatory six to seven lessons a day with inanimate teacher who does not sense and respond to their problem of language and pace of instruction.

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 (Ibid: 128). 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; 2000; Ali 2005).

A single fact that all earlier studies on the subject unanimously agreed was the fast pace of plasma instruction (Gary 2005; Ali 2005; Getnet 2006; Temtim 2007; Kassahun & Zelalem, 2006). For example; according to Gary “… every thing about the program is too fast. Students cannot take in what presenters are saying; there is not enough time to complete the exercise or to copy the notes given on the screen”. In this study, 79.1% of teachers agreed that plasma lessons have appropriate pace (Table-1). In spite of accumulated research findings that state otherwise, such high positive response rate was probably attributed to the way the item was stated in the questionnaire for it does not clearly specify in terms of students capability because on the other hand students are complaining about it. Though schools had now three years experience with the innovation, still 47.1% of students believed that the pace plasma instruction was not appropriate to their level (Table-1).

To evaluate plasma lesson with respect to its ability to motivate aspects of students’ need like, access to quality education, its consideration for the special needs of visually and hearing impairment students and the pace of instruction were identified. Table-2 conveys some of the students’ variable to which research participants were asked to indicate their degree of agreement and/ or disagreement.

Table-2: Consideration of students need conveyed by the plasma lesson, as reported by the two groups
As shown in Table-2 above, the ability of plasma lesson in motivating and giving equal access to quality education to all students by encouraging them and providing clear instruction were positively rated (more than 60%) by both students and teachers respondents. Regarding giving chances to students for group discussion during PTV lessons was rated low by both students (36.0%) and teachers (38.9%). 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 lesson provide both sound and vision hence marginalizes students with both hearing and sight impairment. Large proportion of teachers did not believe the fact that visually impaired students were significantly hindered by the technology. For example; 56.1 percent of students and about 79.2 percent of teachers believed that the technology had no place for the hearing impaired
students. Though vary in magnitude both groups believed that the technology had limitation for hearing impaired students. The authoritative statement in governments 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 governments concerns (Brook 2007).

Subject contents are the substance of teaching. Teachers are expected to select those contents that seemed most likely be important to students. Moreover, P.R.Halmos (1994) stated that the most effective way to teach mathematics by problem solving is to keep challenging students with problems that are barely within their reach. Such principle implies that thorough coverage of the most important, useful content was more desirable than covering everything superficial. They advised the need to regards content not as an end but rather as a means to knowledge and learning that was not available for use was not of much value.

**Table-3: Relevance of plasma lesson content and tasks, as reported by both groups**

<table>
<thead>
<tr>
<th>No</th>
<th>Issues of content and tasks</th>
<th>Agree (%)</th>
<th>Disagree (%)</th>
<th>Total No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Stud</td>
<td>Teach</td>
<td>Stud</td>
</tr>
<tr>
<td>1</td>
<td>The depth of the content is up to the level of students</td>
<td>63.2</td>
<td>70.0</td>
<td>36.8</td>
</tr>
<tr>
<td>2</td>
<td>The content contains the most important points to be covered</td>
<td>81.9</td>
<td>90.2</td>
<td>18.1</td>
</tr>
<tr>
<td>3</td>
<td>It gives appropriate class work</td>
<td>72.2</td>
<td>82.1</td>
<td>27.8</td>
</tr>
<tr>
<td>4</td>
<td>It gives feedback to class work</td>
<td>65.9</td>
<td>78.7</td>
<td>34.1</td>
</tr>
<tr>
<td>5</td>
<td>It gives appropriate homework</td>
<td>76.9</td>
<td>56.9</td>
<td>23.1</td>
</tr>
<tr>
<td>6</td>
<td>It gives feedback to homework</td>
<td>49.9</td>
<td>42.2</td>
<td>50.1</td>
</tr>
</tbody>
</table>
As shown in Table-3 students and teachers were asked to rate the scope and depth of the plasma lesson content. Concerning the depth of plasma lesson content, about 63.2% of students and 70.0% of teachers agreed as appropriate. Similarly the content covered by plasma lesson agreed relevant by significant majority (81.9% and 90.2%) of students and teachers respectively.

About 65.9% of students and 78.7% of teachers agreed that feedback was given to class tasks. Students were occasionally asked to carry out tasks framed between 20 to 40 seconds, the immediate feedback given to after the time set discouraged them from attempting the task. According to Kassahun and Zelalem (2006), most students do not cope with the plasma teacher and are not able to finish the tasks on time. After all, it does not matter if students attempt to carry out the tasks or not; the answers will appear on the screen at the end of the allotted time. Feedback to homework was only agreed by 49.9% of students and 42.2% of teachers.

Though the relevance of school curriculum had long being 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; 68). The plasma presents ‘rich content but it is not selective (Tewodros 2006: 69). The appropriateness of the class work tasks of the plasma lesson was also agreed by both research participants (72.2% by the students and 82.1 % by teachers). In general, more percentage of students (76.9%) seem to agree with the appropriateness of giving homework, but on the other hand almost half of the teachers disagreed with the appropriateness of the homework given to students. Moreover, both students and teachers agreed that PTV uses in most cases self assessment
method where as it does not encourage students to discuss in
groups and help each other.

Based on available finding, 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 was indeed
a success that 81.9% agreed by the students and 90.2% by their
teachers.

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 some classroom
teachers. Was there anything meaningful done to reduce the scope
of existing national curriculum and taught only what seemed to be
relevant? Based on existing findings, this concern of
policymakers was addressed through the elevation 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, too little time
given to student’s participation, absence to the time for student’s
problem and no feedback from the plasma teacher.

Table-4 outlined some of the participatory possibilities
rendered inherent in the nature of the technology and major policy
rhetoric were outlined to which research participants were asked
to rate these delivery items based on their level of agreement and/
or disagreement.
Table-4: The Nature of the televised program delivery system, as reported by respondents

<table>
<thead>
<tr>
<th>No</th>
<th>Aspects of plasma lesson</th>
<th>Agree (%)</th>
<th>Disagree (%)</th>
<th>Total No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Stud</td>
<td>Teach</td>
<td>Stud</td>
</tr>
<tr>
<td>1</td>
<td>It cannot replay back</td>
<td>54.6</td>
<td>83.6</td>
<td>45.4</td>
</tr>
<tr>
<td>2</td>
<td>It gives enough time to do the given class work</td>
<td>36.0</td>
<td>33.6</td>
<td>64.0</td>
</tr>
<tr>
<td>3</td>
<td>It gives enough time to copy notes</td>
<td>55.2</td>
<td>9.8</td>
<td>44.8</td>
</tr>
<tr>
<td>4</td>
<td>It makes students to have equal access to quality education</td>
<td>72.3</td>
<td>86.9</td>
<td>27.7</td>
</tr>
<tr>
<td>5</td>
<td>In considers individual differences</td>
<td>75.3</td>
<td>28.7</td>
<td>24.7</td>
</tr>
<tr>
<td>6</td>
<td>Tracking while the lesson is on progress</td>
<td>70.3</td>
<td>69.5</td>
<td>29.7</td>
</tr>
<tr>
<td>7</td>
<td>The lesson presented in the neighboring class disturb while the class in progress</td>
<td>39.0</td>
<td>29.3</td>
<td>61.0</td>
</tr>
<tr>
<td>8</td>
<td>It utilizes a variety of teaching aids</td>
<td>78.6</td>
<td>87.4</td>
<td>21.4</td>
</tr>
</tbody>
</table>

As shown in Table-4, the PTV system was revealed deficient and in-appropriate like it cannot replay back when the needs arise to clarify things, agreed by students at the rate of 54.6% and teachers at the rate of 83.6%. The ability of the technology in providing a variety of teaching aid was agreed by 78.6% of students and 87.4% of teachers. Though classroom tasks and content of the plasma lessons were considered relevant, the adequacy of the time given for class work and taking notes were disagreed by most participants. About 64.0% of students and 66.4% of teachers felt that the time set for class work was not appropriate. Usually the allotted time for doing exercises were not sufficient, to which students had to risk understanding of the question for writing it. Understanding of the problem was relegated to secondary status.
Furthermore, time assigned to copy notes from the plasma display was rated as not enough by 90.2% of teachers while on the contrary almost half of the students (55.2%) agreed that the plasma gives enough time to copy notes. The two parties also differed in their opinions when coming to the aspects of PTV lesson considering individual differences which was disagreed by the teachers at higher rates 71.3% while the students opinions were the opposite in these issue the agreement rated 75.3% (Table-4).

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 component teaching force. As Dugdale(2003) stated that the teacher’s skill in integrating technology into the mathematics curriculum according to sound pedagogical principles is essential to get the needed support of a technology for the proper implementation.

In addition to the existence of ill-qualified teachers, most of those who are currently teaching are beyond their capacity. Thus, plasma lessons provide best teachers that helped school teachers to learn not only the language, but also the method of teaching. Table-5 outlines some of such claims to which both students and teachers were asked to indicate their level of agreement.

**Table-5: Considerations of the Technology to the Need of Teachers, as Reported by Students and Teachers.**

<table>
<thead>
<tr>
<th>No</th>
<th>Aspects of teachers</th>
<th>Agree (%)</th>
<th>Disagree (%)</th>
<th>Total No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Stud</td>
<td>Teach</td>
<td>Stud</td>
</tr>
<tr>
<td>1</td>
<td>Teachers have good opportunity to learn teaching techniques from plasma lessons</td>
<td>27.2</td>
<td>82.9</td>
<td>72.8</td>
</tr>
<tr>
<td>2</td>
<td>It gives enough time to classroom teachers to help students to do class work</td>
<td>72.0</td>
<td>27.7</td>
<td>28.0</td>
</tr>
</tbody>
</table>
According to this study, the PTV teachers were elevated 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, despite 82.9% of teacher agreed that the plasma lesson gave them opportunity to learn various teaching method, about 72.8% of students disagreed. The majority of the students considered the new innovation do not have much worthy to teach teachers about methodology.

Though the actual teaching was made by the plasma TV teacher, classroom teachers were expected to play the role of facilitation. 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 instruct classroom teacher to check, correct or guide and the time left for this was judged inadequate 72.3% by teachers and 28% by students.

On the other hand, only 58.4% of students and 64.4% of teachers agreed with the statement that the plasma lessons will solve problem of qualified teachers. Since the lion share of instructional time was given to the technology, about 50.7% of students and 63.4% of teachers agreed that it decreased teacher work load. The technology deprived teachers from making instructional decisions to which they used to have (Ali 2005; Brook 2006; 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 46.6% of student and 56.6% of teacher believed that the technology would decrease teachers’ creativity.

Audiovisual instructional materials are appropriate for they facilitate teaching learning process, though they could not substitute classroom teacher. They do make learning more interesting and vivid by appealing students’ attention and promoting motivation and retention. 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 their some criteria. Students were asked to indicate their agreement to such quality of audio visual provisions rendered by the plasma TV.

**Table-6: Quality of Visual Experiences attributed by the Plasma TV**

<table>
<thead>
<tr>
<th>No.</th>
<th>Aspects teachers</th>
<th>Agree (%)</th>
<th>Disagree (%)</th>
<th>Total No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Stu</td>
<td>Teac</td>
<td>Stu</td>
</tr>
<tr>
<td>1</td>
<td>Uses relative sizes of font to give emphasis to important ideas</td>
<td>80.</td>
<td>98.4</td>
<td>19.</td>
</tr>
<tr>
<td>2</td>
<td>Uses upper and lower case letter to make reading easy and fast</td>
<td>75.</td>
<td>96.0</td>
<td>24.</td>
</tr>
<tr>
<td>3</td>
<td>Uses bold text to emphasize information</td>
<td>85.</td>
<td>94.0</td>
<td>14.</td>
</tr>
<tr>
<td>4</td>
<td>Text and images stand apart from the background and be easily seen</td>
<td>84.</td>
<td>94.3</td>
<td>15.</td>
</tr>
<tr>
<td>5</td>
<td>Uses bright or different sizes for emphasis which catch up the attention of the viewer</td>
<td>84.</td>
<td>96.0</td>
<td>15.</td>
</tr>
<tr>
<td>6</td>
<td>Text and colored backgrounds (or backgrounds images)</td>
<td>82.</td>
<td>81.0</td>
<td>17.</td>
</tr>
</tbody>
</table>
It does not use complicated background that make the next difficult to read

As shown in Table-6, the plasma lesson uses relative size and bold fonts for giving emphasis to important ideas; facilitate easy and fast reading of texts by using upper and lower cases letters. Similarly the appropriateness of colour used by the plasma lessons was judged by the research participants. Thus the majority of respondents did agree that to maximize attention, visibility and legibility of information, the plasma lesson uses bright of different color, contrast color between text/image background, the rates varied from at least 75% where many of them between 80th and 90th percent ranges.

**Table-7: Quality of Auditor Experience rendered by the Plasma TV Lessons, as reported by Student and Teachers.**

<table>
<thead>
<tr>
<th>No</th>
<th>Aspects teachers</th>
<th>Agree (%)</th>
<th>Disagree (%)</th>
<th>Total No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>St Teach</td>
<td>St Teach</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>It is audible for students sitting at the back</td>
<td>90. 94.</td>
<td>9.9 5.7</td>
<td>2585 123</td>
</tr>
<tr>
<td>2</td>
<td>It is easy for students to understand the pronunciation</td>
<td>68. 67.</td>
<td>32. 32.</td>
<td>2585 122</td>
</tr>
<tr>
<td>3</td>
<td>It is easy for students to understand the meaning</td>
<td>42. 59.</td>
<td>57. 40.</td>
<td>2518 124</td>
</tr>
<tr>
<td>4</td>
<td>It has good quality sound that can pay the attention of students</td>
<td>70. 89.</td>
<td>29. 10.</td>
<td>2608 124</td>
</tr>
</tbody>
</table>
As shown 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. More than 90% of respondents agreed that lessons were audible even to students who sit at the back. Quite similarly, 70.6% of students and 89.6% of teachers agreed with the good quality of sound.

On the other hand, the pronunciations of plasma presenters and students understanding were somehow accepted by majority of the respondents. For instance, only 68% and 67.2% of students and teachers respectively agreed that students easily understand the pronunciation of lesson presenters. What seemed worrying as attested in various studies, were the problem of understanding as a result of the combined effort of pace and high language demand of the lesson. Participants were asked whether understanding the meaning was easy to which about 57.9% of students disagreed.

In addition, all the motion experiences in question were agreed by research respondents that, the ability of plasma lesson in providing visual information that is difficult to convey in words was agreed by 77.4% of students and 89.3% of teachers. Lastly, before the lesson was over the plasma was rated positively (80.2% and 81.3% by students and teachers respectively) in summarizing the daily lesson.

One can use multiple and appropriate assessment methods for class room to make learning fruitful. In this regard students and teachers were asked to rank the evaluation methods mostly used during the learning activities during Mathematics class. Accordingly, self assessment was ranked first at the rate of 10.9% by the students and 25.8% by the teachers which was not significant related to the ranks beyond that. The remaining assessment styles like group discussion, reflection peer assessment were far below 5% by the rates of both parties.
After the Broadcast of the PTV lessons:
When the broadcast was over, teachers are generally expected to give overall summary of the program, concentrate on those issues he/she identified during broadcasting that requires further explanation and address any other queries from the students. Teachers need to identify and discuss issues of the lesson that may present challenge to students address any other quarries from the students. Finally the teacher was expected to introduce the title and content of the next televised program and advise students concerns on the program.

Students were also expected to consolidate what they have learned attending closely classroom teachers’ explanation on the summary of the lesson. They further are expected to ask any question pertaining to difficult issues they experienced during the broadcast and strengthen their note by relating what they write during the broadcast from their textbook and other reference materials. Finally they need to perform homework and project suggested by televised teacher and show their results to the classroom teacher.

According to the query on how the teachers consolidated and summarized the PTV lessons at the end, the majority of students (57.4%) agreed that the time given to classroom teacher for making summary of the lesson was low. 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 making summary of the lessons within ten minutes (Kassahun & Zelalem, 2006).

Though the time given for making summary was rated low, teachers’ interest to give summary at the end rated satisfactory by 74% of students. Similarly 73.7% of students
responded that the way teachers made summary at the end is satisfactory even many of them rated good. Moreover, students are asked to estimate the time given to teachers for consolidation and 60% of students said 10 minutes which is the highest and 28% of them said 5 minutes which is the next. In general 90.2% of them suggested the consolidating time ranging between 5 and 10 minutes. Since the majority were not satisfied for the above time ranging from 5 to 10 minutes, they were asked to suggest a change of time. Accordingly, 84% of them suggested the time to range from 10 to 20 minutes, specially, 16% of them for 10 minutes, 30% for 15 minutes and 38% for 20 minutes.

Major Challenges Noted:

In general those problems encountered since the introduction of televised instruction could be classified in to two: problems encountered as a result of broadcasting the program (problems inherent within the program) and problems encountered as a result of lack of the feeling of ownership and responsibility among the users of the program. A study made by MOE/EMA to identify implementation of the technology includes problems related to the use of the technology and adequate handling of the satellite facilities.

Some of the problems were related to contents of the subject. These problems were related to misappropriate contents encountered in existing programs, mismatch between subject content with students ability and problem of sequencing of course contents. Some other problems related to program presentation speedy pace of presentation and shortage of time for the assigned tasks. Shortage of time given to classroom teacher before and after transmission, contributed significantly for teachers to make inadequate support to students learning. Similarly during transmission, inadequate time was assigned for taking notes, perform exercises and respond to questions, As a result, it worked
against the expected student-centered method application introduced as part of pedagogical reform.

Problems related to program broadcasting are attributed due to technical and natural causes. Technical problems were associated with channel confusions, problems associated with maintaining the various facilities, VSAT and plasma TV by thunder and heavy windy rain resulting power interruption.

In line with the shortage of supportive materials (teacher and student guides and broadcast schedule) were not available to schools before the commencing of the academic year whereas the ministry at the beginning thought that modules will be distributed to all government schools so that they copy the CD and distribute to students and teachers. Whereas in reality, schools did not have the facility to duplicate the modules and distribute in time. Similarly, student textbooks did not only arrived late but also not distributed on a one-to-one basis. This definitely contributed negatively for making teachers and students for advanced preparation before the broadcast.

Lack of ownership and accountability was also a very crucial issue concern that it appears that there is role confusion and responsiveness among the various institutions involved in the implementation of the program. In general lack of ownership and feeling of responsibility among various actors responsible for implementing ICT at the national and local levels resulted role and role relationship confusion. This will result lack of responsible agency for technical maintenance and trouble shooting.

Looking into administrative problems, inadequate training was given to education professionals (teachers, directors and supervisors) at the grass root level about program preparation, presentation, how to handle and use the innovation. There is lack of full participation of the school leadership for they did not
arrange conditions for those teachers who received training to train others.

Due to lack of adequate activities directed towards creating awareness, a number of perception problems are encountered. These includes due to the different practice called for by the innovation, the technology was seen as alien and tendency for “fear of new thing”, considering the satellite program was meant for replacing teachers.

**Conclusion and Recommendation:**

**Conclusion:**

Even though the innovation was introduced to the secondary schools four years back, significant percent of both respondents 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 regards would have implication to their extent of use of this time and ultimately on the quality of the lesson understood by students. In other words, the time assigned for classroom teachers pre-broadcasting session was inadequate and it did not consider the range of introductory events that could happens during instruction. As a result of which, 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 variable 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; the content covered by the plasma lesson was relevant and did attend to secondary students’ level of understanding. Similarly, class work and homework task were appropriate even though the feedback were found to be insufficient.

Regarding the nature of the technology itself, along with the problem of pace, the inability of the plasma lessons to replay back and their variance to individual difference were some of the critical issues that need attention. In general, even though plasma lessons uses variety of teaching aids, the time assigned during pre-broadcasting, for class work and for copying notes were not considered appropriate. 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 affect their level of use of the time and ultimately to the difficulty of understanding the lesson by students.

From the comparison of the perceptions of the two parties under study we can generalize that mathematics students and teachers have more or less similar attitudes and perceptions about the PTV implementation situations. In addition, though it has relatively significant changes and improvement in the delivery system, it would be very difficult to say that the PTV lessons are totally friendly to both parties due to the very little role given to the actual teachers with respect to time, speed and space. Moreover, we can agree that there is of course conceptual change in injecting ICT support to the conventional learning situations, in which the technology is currently dominating everybody’s life. It supports the learning situations of mathematics in controlling the
timely content coverage, provides experimental demonstrations, additional teaching materials and attributes of presentations. This is with the exceptional challenges that are beyond the PTV delivery system like conducting tutorial sessions for mathematics classes which are unique characters for the subject.

Recommendations
The major recommendations of this study are then:

When plasma is used well in mathematics classes, it can have positive effects on students’ attitude toward learning through attracting their attentions, confidence in their abilities to do mathematics, engagement with the subject matter, and mathematical achievement and conceptual understanding. Therefore careful attention to teacher preparation and development as well as curriculum revision are needed to support effective use of technology in all grades of mathematics class. Assign time to make tutorials and weekly consolidation out of the PTV session so that students improve their problem solving skills and have chances of face to face contact with their teachers. We can say it is not too late that time should be given to redesign the teaching methodology going on in TEI’s (Teacher Educational Institutes, including the universities) when training the high school teachers so that they can use the technology to support their teaching and learning.

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 Akalewold Eshete and Addis Simacheew for allowing us to use the part of data collected in team, and teachers and school authorities who participated in the study and gave us their assistants during the data collection.
REFERENCES:

Inter Africa Group: Background Paper Prepared for the Experts Debate on the Ethiopian Education and Training Policy: November 18, 2004 at UNCC


Tekeste, N (1996) Rethinking Education in Ethiopia (Uppsala, Nordiske Afrikainstitutet).

