The Satellite Television Broadcast Learning Situations in Mathematics and Science Subjects in Ethiopian High Schools: A Comparative Study

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Abstract
Even though ICT in Ethiopia is still in its infancy, it has developed rapidly in recent years. In part this was due to the recognition of the vital importance of ICT in the development process. The Government has been undertaking several strategic policy initiatives that promote its development. For this initiative, the venture taken by Ethiopian government, implementing plasma television broadcast lessons in six selected subjects of high schools is one example. The purpose of this study was then to evaluate and compare the perceptions of students and teachers in learning situations of satellite plasma television (PTV) lessons in Mathematics and Science subjects (Biology, Chemistry and Physics). The design of this comparative study was cross-sectional mainly following quantitative approach in the four subjects in purposively selected secondary schools of four regional states of Ethiopia, Oromia, Amhara, Southern Nation & Nationality Peoples Regional States (SNNPR) and Tigray; questionnaires administered on high school students and teachers 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 time allotted to school teachers to act properly on introduction, consolidation and assisting students during class activities was not appropriate. On the other hand, the two parties agreed that there indeed was a new conceptual change in quality improvement on the delivery system when PTV was added to support quality of teaching, presenting variety of teaching aids, laboratory demonstrations, content coverage and the like. The major recommendations of this study are then to revise the overall PTV delivery system, emphasis on scheduling in such a way that school teachers could have sufficient time and space in order to make the learning situations plausible and fill in the gaps that could not be handled by the technology; it would be wise if the PTV supports the school teacher instead of the otherwise, and it is time to redesign the teaching methodology going on in training centers.
Key words: Plasma TV lesson, pre-broadcasting, broadcasting phase, after broadcasting, high schools, mathematics and sciences

Introduction

Even though ICT in Ethiopia is still in its infancy, it has developed rapidly in recent years. In part this was due to the recognition of the vital importance of ICT in the development process. 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. For this initiative, the venture taken by Ethiopian government, implementing plasma television broadcast lessons in six selected subjects (English, mathematics, Biology, Chemistry, physics and Civics and Ethical Education) of high schools is one example.

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 manpower and create communities that utilize modern system of information. On the other hand; contrary to policy rhetoric, some studies conducted at school level revealed that school actors have negative perceptions due various reasons (Brook 2006; Ali 2005). This is beyond the students frustration observed from our day to day activities in teaching. Thus, it requires the need to investigate to what extent these prevalent perceptions were shared by both students and teachers in the same domain. The purpose of this study is therefore to make a comparative study between the perceptions and views of students and their teachers involved under this program.

Satellite television program now given to secondary schools was based on national curriculum. The written scripts for these programs were made based on identifying content specification through consulting formal education flowcharts, syllabi and teaching learning materials from grade 9-12. In line to this, the two general widely used methods of presenting educational televised programs-as **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 (most teachers teach beyond their levels of training), shortage of teaching-learning materials and lack of awareness among teachers about the importance of ICT.

For this, the country invested considerably on satellite education television programs. 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. In order for this innovation serves its purposes, students and teachers need to understand and play their roles and responsibilities.

Teachers in Ethiopia, until quite recently, provide their lessons without any assistance, performing the teaching learning process without the help of teaching aids. Now with the assistance of the technology they can easily monitor and support their student's learning progress and development. The ability of the technology to simulate and simplify complex concepts and coordinate it with motion and picture will facilitate learning as the saying goes "picture speaks more than one thousand words". The ability of the technology to present distance and other new places (moon and different continents for example) and even microscopic materials, sometimes beyond the reaches of classroom teachers. It also conserves/ minimizes time and space to issues that in reality took longer time (for example; process of germination up to flowing and development of fruits).

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 laboratory equipments 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.

Statement of the problem: 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 and due to the effects of using mother tongue as a medium of instruction for the entire primary education. Teachers and parents consistently complained for the apparent difficulty secondary students' face in using English, when English was turn out to be the medium of secondary education. Basic reasons were given as a foundation to start with these six subject areas, many of them sciences streams.

On the other hand, 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 2002), 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.

The purpose of the study is to disclose some of the issue surrounding implementation of plasma television (PTV) program 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.

Objective of the study: Therefore, the general objective of this study was to evaluate and compare the perceptions among students and teachers learning situations of satellite plasma television lessons in Mathematics and Science subjects (Biology, Chemistry and Physics). To this effect, this study used the following specific objectives:

- Compare the two respondents with respect to their backgrounds;
- Examine and compare teachers and students perceptions in line with the roles played between TV teachers, school teachers and students, the challenges encountered during implementation
- Investigate potential changes (the merits and demerits) to patterns of usage of the technology among teachers and students.

Significance of the Study: The study is assumed relevance to improve the system of TV broadcasting implementation in providing the feedbacks for the strengths and weakness of the program to the concerned bodies, mainly in overcoming the identified challenges. Consequently it plays a crucial role to create 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.

Research Methodology

Research Design: The design of this comparative study was cross-sectional mainly following quantitative approach supported by qualitative (open ended) through questionnaires focused on the

current status of implantation of satellite plasma television broadcast in Mathematics and Science lessons in selected secondary schools of four regional states of Ethiopia, Oromia, Amhara, Southern Nation & Nationality Peoples Regional States (SNNPR) and Tigray. 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.

Sampling: 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.
Teachers and students that participated in this study were also sampled appropriately. Accordingly, 40 students in each subject per grade levels (9th to 12th) per school were selected which makes a total of 1408 sample size. Similarly, 20 teachers in each subject per school making a total of 440 sample size were determined. In general a total of 89.88% (12,655) students and 442 teachers (more than expected) responses were returned safely.

Instrument and data collection: Self administered questionnaire were distributed through assistant data collectors right at the spot supported by documentary information. Instruments were revised and refined through the review of three senior experts. The data processed by SPSS package through descriptive analysis.

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

Analysis and Discussion

Background: In this study a total of 12, 945 participants were involved expressing their background, out of which 12, 503 were students and the remaining 442 were teachers. Sex wise, 64.7% of the students were males while the rest 35.3% were females, here the rate of male teachers was 94%. Majority of the student respondents (92.3%) were in their appropriate school age, ranging from 14 to 20 years old. When students were associated by their university departments/subject areas the analysis showed significant difference at P=0.000 (df=15), but the association of their teachers in the same manner is quit the opposite P=0.894 (df=9). Comparing these two groups grade wise, majority of the students found in 10th grade (30%) followed by 12th grade (24%) while the highest for their teachers was teaching in the same grade levels 10th (63.5%) and 12th (26%).

Concerning the experience of teachers in teaching, 66.5% of them had served in the profession between 10-37 years where as only 18.7% of them served below 5 years by the time of this study. Beyond their rich experience, majority of them (about 84.6%) were qualified having first degree and above in their respective subjects of specialization. About 63.7% and 26% of them had experience in teaching at grade 10th and 12th respectively. The majority of teacher respondents (about 95.4 %) had between 15-30 hours workload per week.

Plasma TV Implementation Session

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.

Pre-Broadcasting of Plasma lessons

Teaching and learning process was generally dependent on adequate planning, otherwise would fail to attain its purpose. In order to conduct relevant task; teachers would need to prepare their educational plan kin advance. They are expected to make a brief introduction about the daily televised lesson by concentrating on the title, specifies objectives and content of the program.

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, which was reflected in the study by both respondents. 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, later on improved to 2 minutes for introduction and 10 minutes for summary out of 42 minutes.

Participants were also asked to judge the adequacy of the introduction time assigned to the classroom teacher. Accordingly, both students and teachers agreed that there was not sufficient time for introduction. In this issue of time adequacy for introducing the lesson, it was judged as either poor or very poor by 61.6% and 52.6% of teachers and students respectively. 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 due 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 nothing more meaningful than acting like operator- opening and closing the television (Getnet 2008; Brook 2007). Of the respondents, 82.9% suggested the time for introduction to be 5-20 minutes while 87.1% of teachers also suggested between 5-10 minutes, where the majority (55%) of them believed that five minutes would be enough.

The Broadcasting Phase

In general, the MOE/EMA believes that satellite television program was designed to help classroom teachers. 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 provide short introduction about the program before broadcast begins, encourage students to attentively follow the lesson, follow and provide help to students. He/she should entertain students' questions and give comment, encouragement, take note of those issues that he/she believed require further explanation and do not interfere while the televised teacher is conducting lesson.

Teaching and learning would be more enhanced if objects and materials were well organized. Here the study identified some of the issues of lesson organization for research participants to make suggestion. Accordingly, as shown in Table-1, 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 issues were found to be greater than that of students. The majority of respondents agreed with the fact that plasma lessons revises previous lessons, state clearly the objectives and content of the lesson. In general, the plasma lessons were found to be well-planned and well-organized. The only variable with the highest percentage of students who disagreed (44%) was whether the plasma lesson were well paced during presentations showing students had difficulties in coping up to its speed.

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

No	***Aspects of lesson planning***	***Agree (%)***		***Disagree (%)***		**Total No.**	
		Stud	**Teach**	**Stud**	**Teach**	**stud**	**teach**
1	It revises the previous lesson	63.6	89.1	36.4	10.9	11743	431
2	It clearly states daily instructional objectives	84.7	83.6	15.2	16.4	11674	433
3	It clearly states the content of daily lesson	84.1	94.5	15.9	5.6	11658	434
4	It provides a summary of the daily lesson	81	89.6	19	10.4	11713	434
5	The lessons are well paced/speed	56.1	80.8	43.9	19.2	11653	428
6	The lessons are well organized	81.9	90.1	18	9.9	11756	435
7	The lessons are well planned	76.8	88.6	23.2	11.5	11496	429

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; 2007; 2008; Getnet 2006; Temtim 2007; Kassahun M. & Zelalem T., 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" (2005). In this study, 80.8% 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.

As shown in Table-2 below, 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 remote by both students (37.4%) and teachers (48.7%). It was acknowledged that the variety of information, visual and audio experiences;

often beyond the capacity of the classroom teacher to assemble, would sustain student's attention and motivation.

Table-2: Consideration of students need conveyed by the plasma lesson, as reported by students and teachers

No	*Aspects of students need*	*Agree (%)*		*Disagree (%)*		**Total No.**	
		Stud	**Teach**	**Stud**	**Teach**	**Stud**	**Teach**
1	It motivates students to learn	67.4.6	74.4	32.6	25.6	11524	429
2	It encourages students to participate	76.9	68.3	30.3	31.6	11283	433
3	It clearly communicates to the students	71	60.3	29	39.7	11632	428
4	It has no place for visually impaired students	39.5	79.4	60.4	20.6	11829	413
5	It has no place for hearing impaired students	57.1	76.3	42.9	23.7	11382	413
6	It gives chance for students to discuss in groups	37.4	48.7	62.6	51.3	11576	431

Definitely the direct instructional approach to media utilization opted by the designers was correlated with 71% and 60.3% of students and teachers agreement respectively. That was why most participants assumed that the time given for students activities were low. About 62.6% and 51.3% of students and teachers respectively agreed that plasma lesson does not give sufficient time for students to discuss in group.

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 students did not believe the fact that visually impaired students were significantly hindered by the technology. For example; only 39.5 % of students and about 79.4 percent of teachers believed that the technology had no place for the visually impaired students.

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; Tewodros 2006; 2007) that makes students with weaker sight impairment at relatively advantageous position compared to students with hearing impairment who could not access the spoken medium for it was not supported with sign language where the fact was agreed by both parties.
Subject contents are the substance of teaching. Teachers are expected to select those contents that seemed most likely be important to students. Such principle, according to Callahan & Clark (1982:5) refereed as the doctrine of contingent value. 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 students and teachers

No	*Issues of content and tasks*	*Agree (%)*	*Disagree (%)*	**Total No.**

		Stud	Teach	Stud	Teach	Stud	Teach
1	The depth of the content is up to the level of students	63.7	70.4	36.4	29.6	11690	432
2	The content contains the most important points to be covered	82.3	91.5	17.6	8.5	11701	434
3	It gives appropriate class work	72	78.4	27.9	21.6	11327	430
4	It gives feed back to class work	66.2	78.6	33.8	21.4	11619	430
5	It gives appropriate homework	76	52.9	24	47.1	11368	433
6	It gives feedback to homework	50.1	35	49.9	64.9	11268	427

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 63.7% and 70.4% of students and teachers respectively agreed as appropriate. Similarly the content covered by plasma lesson were agreed relevant by significant majority (82.3% and 91.5%) of students and teachers respectively.

About 66.2% and 78.6% of students and teachers respectively agreed that feedback was given to class tasks. Students were occasionally asked to carryout tasks framed between 20 to 40 seconds, the immediate feedback given to after the time set discouraged them from attempting the task. According to Brook (2008:33) 'Most students do not cope with this situation 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 home work was only agreed by 50.1% and 35% of students and teachers respectively.

The appropriateness of the class work and homework tasks of the plasma lesson was also agreed by both research participants (76% by the students and 53% by teachers). In general, more percentage of teachers (78.4%) and students (72%) seem to agree with the appropriateness of giving class work, except the weak provision of feed backs to home works rated 64.9% by the teachers against it (Table-3).

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 55.3% and teachers at the rate of 76.6%. The ability of the technology in providing a variety of teaching aid was agreed by 83.6% and 93% of teachers and students respectively. 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 63.8% and 74.2% of students and teachers respectively felt that the time set for class work was not appropriate. Usually the set 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.

Table-4: The Nature of the televised program delivery system, as reported by students and teachers

No	Aspects of plasma lesson	Agree (%)		Disagree (%)		Total No.	
		Stud	Teach	Stud	Teach	stud	teach
1	It cannot replay back	55.3	76.6	44.6	23.4	11306	415
2	It gives enough time to do the given class work	36.2	25.9	63.8	74.2	11659	430
3	It gives enough time to copy notes	54.1	11.3	45.9	88.7	11603	436
4	It makes students to have equal access to quality education	71.1	82.2	28.9	17.5	11517	436
5	In considers individual differences	75.8	26.9	24.2	73.1	11599	435
6	Tracking while the lesson is on progress	68.4	72.1	31.6	27.9	11450	405
7	The lesson presented in the neighboring class disturb while the class in progress	38.6	30.8	61.4	69.2	11603	434
8	It utilizes a variety of teaching aids	83.6	93	19.4	7	11713	430

Besides, the two parties differed in their opinions when coming to the aspects of PTV lesson giving enough time to copy notes and considering individual differences which was disagreed by the teachers at higher rates 88.7% and 73.1% respectively while the students opinions were the opposite in these two issues the agreement rated 54.1% and 75.8% respectively.

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 helped school teachers to learn not only the language, but also the method of teaching.

As shown in Table-5, some of the rhetoric of the technology was supported in this research. The plasma TV 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 82.6% of teacher agreed that the plasma lesson gave them opportunity to learn various teaching method, about 72% of students disagreed. The majority of the students consider 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. To this fact, about 74.4% 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 instruct classroom teacher to check, correct or guide and the time left for this was judged inadequate 75.8% by teachers and 28% by students.

On the other hand, only 57.5% and 66.3% of students and teachers respectively 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 50.1% of students and 68% of teachers respectively 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 48.1% and 53% of students and teacher respondent respectively 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 (ibid). 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.

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; 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 agreed 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 in 80th and 90th percent ranges.

The majority of participants (89.9% and 96.1% of students and teachers respectively) agreed that lessons were audible even to students who sit at the back. Quite similarly, 70.4% and 91.4% of students and teachers respectively agreed with the good quality of sound.

For example, 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 and 92.2 percent of students and teachers respectively. 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, many of them rated in 70th and 80th percent.

After the Broadcast

In this session, after the broadcast, students and teachers are generally expected to go overall summary and assessment activities, the teachers to consolidate the major points of the daily lesson integrating different assessment techniques while students reflect based on their understanding. Finally they need to perform homework and project suggested by televised teacher and show their results to the classroom teacher. In this regard, the study identified some of teachers' instructional variables as per the questions that the participants asked to reflect the extent of their agreement on how the teachers consolidated and summarized the PTV lessons at the end. Accordingly, the majority of students (56.1%) 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 summery of the lessons within ten minutes (Ali, 2006).

Conclusions and Recommendation

This section has two major sections, conclusions made in line with the findings and followed by recommendations to address some of the problems identified by the study.

Conclusions

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. 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 task were appropriate even though the feedback were found to be insufficient.

Concerning the nature of the technology itself; along with the problem of pace/speed, the inability of the plasma lessons to replay back, the insufficient time and role given to the school teacher to introduce, summarize and interfere in assisting students during the broadcasting session, the language barrier, very small time for note taking and class exercises, no entertainment for question and answer, no special attention for impaired students, lack of face to face laboratory practice and tutorial sessions mathematics classes were some of the serious problems.

Recommendations

In this study we then recommend; to revise the overall PTV delivery system, emphasis on scheduling in such a way that school teachers could have sufficient time (5-10 minutes for introduction as suggested many of the respondents) and position/role in order to make the learning situations plausible and fill in the gaps that could not be handled by the technology; like assisting the impaired students, supervising the class activities, absorbing students reflection, conducting tutorials for mathematics classes, facilitating the actual laboratory practices for science subjects, replacing the TV lesson during interruption, etc

It would also be wise if the PTV supports the school teachers instead of the otherwise which is currently going on in all schools, for a smooth transition to blended learning to complete e-learning through time.

In general we recommend that it is time 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 fit into the new technological system.

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