Interactive television in primary schools: children's experiences of learning with SOFNet

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> I like the interaction because it makes you a part of the program. Instead of just sitting there and watching it, it actually makes you a part of the program.
> (Grade 3 Student, rural primary school).

Interactive television (ITV) is relatively unusual as an educational medium in primary schooling where the face-to-face classroom dominates. SOFNet (Schools of the Future Network) is the name given to the government funded ITV provision for (public and private) schools in Victoria. SOFNet has been used in Victoria for approximately the past five years to provide education in some key curriculum areas, especially in Languages other Than English (LOTE), but also significantly in science and technology, as well as in other individual areas. Unlike previous forms of television broadcasting to schools, SOFNet in Victoria is 'narrowcast' via satellite to any school, and the schools and their children may interact in a variety of ways as is described below. This paper discusses some preliminary analyses of data collected as part of a two-year research project funded by the Australian Research Council investigating the ways in which primary and secondary school teachers use the Victorian satellite broadcast interactive television system called SOFNet to enhance the educational experiences of their students. The first year of the project, 1998, focused on the use of SOFNet in primary schools in Victoria and interstate. The second year of the project focuses on its use in secondary schools in Victoria and interstate. This paper focuses on the children's experiences of using ITV in their learning, it is parallel to, and draws upon, a paper focusing on the teachers' perspectives which was presented previously at the 1999 conference of *Open and Distance learning Association of Australia* (Evans, Stacey and Tregenza, 1999).

THE CONTEXT OF ITV IN SCHOOLING

Although educational research into schooling plays a large part in the work of AARE members, the context of the research is typically that of the school classroom or the school itself as the educational site. However, the use of satellite, cable and, increasingly, digitised forms of ITV broadcasting and 'narrowcasting' has become an important feature of 'distance' schooling in countries, such as Australia, where geography, demography and/or climate make it difficult to provide efficient 'traditional' schooling across the range of curricula required of schools. Canada and Scandinavia are two other examples of ITV being significant in schooling (Haughey and Roberts, 1996; Meisalo, 1996). In Australia, Victoria's SOFNet is arguably the most widespread system-wide ITV provision of any similar school system in the world (Aliani, 1995). SOFNet programs are used in neighbouring interstate schools by arrangement and there are also other examples of smaller ITV networks (for example, in Western Australia and Queensland) in operation in Australia.

Whilst, until early this decade, broadcast television played a small, but important, part in schooling through ABC television, a recent emphasis has been on school authorities using new computer and communications media to fulfil their mandate to provide schooling for all people of school age. While the Internet-based media are developing in Victoria, ITV has both preceded and paralleled these developments. However, unlike TV broadcasts, the emphasis in ITV has been on the 'I', that is building *interactivity* into the provision. That is the sorts of interaction and dialogue which teachers and students expect in the school classroom, but not of television. SOFNet builds its interactivity into its programs in several

ways, although one of them is *not* what some would see as 'real' interactive television, that is with two way audio and video interactivity. In effect, SOFNet programs are 'narrowcast' to all schools via satellite, but the schools only have a satellite-transmission *receiving* dish; they have no 'up-link' or transmission capabilities. However, SOFNet does encourage 'live-to-air' communications from schools using the telephone service. In effect, it is 'talk-back' television, where the viewers (children) can speak to both the program presenters (the surrogate teachers) and to their 'classmates' via telephone to the studio 'on-air'. Perhaps ironically, approximately 80% of the schools using ITV in 1998 used video-recording as their principal classroom use (although many of these would have some live sessions in order to interact). There are other means of interaction, too. Students may phone, fax or email, comments, questions and answers to the program presenters (actually it is effectively to the program team, although the children see the presenters as the only reference points, rather as adults do in other broadcast radio and television). However, in addition, many of the programs are designed with the sorts of 'activities in text' which distance educators have used for some years (see, for example, Lockwood, 1992) where students are invited to answer a question, perform a task or find something out, either during or after the program. Sometimes these activities are encouraged as group activities where interaction is encouraged with one or more other pupils, sometimes with the teacher. Preparation for some of these activities is often encouraged in the teachers' guide to the programs which they are expected to have used before hand.

Although interaction may be seen as important for learning within any curriculum area, arguably it is especially important in the learning of languages (Aliani, 1995). Due to the requirement for schools to provide at least one LOTE in Victorian public schools and due to the lack of LOTE teachers in such schools, SOFNet programming has been dominated by LOTE. Hence, a top priority for SOFNet has been to provide LOTE support, which it has done through regular programs for several different languages, together with supporting materials for the generalist classroom teachers using the programs called 'PALS' (Primary Access to Languages via Satellite). Although there has been some related professional development, this is generally seen by the teachers, especially those working in rural and remote schools, as being inadequate or impractical for their circumstances. As noted previously, the other key area of ITV provision is in science and technology programs called STEPS (Science and Technology Education in Primary Schools). Again, this was designed to address a perceived need for enhanced science and technology education in schools, and a perceived lack of contemporary science and technology expertise on the part of many primary school teachers.

In Victoria, ITV usage increased steadily from a low base and the interstate use increased similarly on an individual school basis (Mark, 1995). By 1997 SOFNet regularly transmitted 600 programs to 2, 500 primary schools via satellite and it was estimated that 100,000 students learned another language via satellite. However, these figures do not reflect a broad use of ITV in primary schooling, on the contrary many schools rarely used it, and many were only occasional users. During 1998, when we conducted our research in primary schools, there were relatively few schools that were using SOFNet on a regular basis and which had integrated it into their school provision by relating the themes in the programs into the curriculum more generally (which the programs and teachers' resource materials encouraged). A few more schools used SOFNet in a specific time-tabled way to deal with a particular curriculum need, such as LOTE, but did not integrate it more deeply. Some schools were occasional users that 'picked and chose' what they used, typically from the non-LOTE programs. We conducted research in schools that were regular and integrated users, regular users and occasional users.

In effect, although SOFNet is intended as a support for schools and teachers to fulfil their responsibilities in key curriculum areas, the 'proof of the pudding' rests in the students' use

and accomplishments in the classroom. Part of our research involved observing children in their ITV classes and recording their responses to the programs in question. We also interviewed the children in groups about their experiences of learning with the SOFNet programs. This paper represents some of the preliminary analyses of the primary school data which has been collected. Due to changes in the ways in which SOFNet programs are being produced and transmitted during 1999 and 2000 (in effect they are being changed to satellite transmitted videos for schools to record, hence, the live-to-air interactive components and some other aspects are being changed) we are planning to conduct further observations and interviews in primary schools. In particular, here we dwell on the children's views of the use of interactive television, especially as concerned with the ways in which they understand, interpret and value the interactivity or not. It is worth dwelling on the importance that is placed theoretically on related matters of interaction, dialogue and educational technology in our interpretation of this data and the research more generally.

Educational technologY, INTERACTIVITY and dialogue

Researchers have claimed that ITV has similar learning advantages to the use of computer-mediated communication (CMC) and audiographics (Oliver & Grant, 1995). Stacey's (1998) research into these technologies, particularly CMC, has found that in the social context of group interaction, the collaborative group develops a consensus of knowledge through communicating different perspectives, receiving feedback from other students and teachers and discussing ideas, until a final negotiation of understanding is reached. Drawing on Vygotsky's (1978) theory that conceptual understandings are developed through verbal interaction, Stacey's research found that a socially constructed learning environment is important for effective learning through technological mediation. Likewise, it was found that dialogue is the means by which the group, particularly through expert feedback, contributes more to each learners' understanding, than they are able to do individually. The social conversation provides the learner with a context and stimulus for thought construction and learning. Such interactive dialogue may be seen as an integral component of effective learning through ITV with the presenters acting as the expert source of feedback and clarification (for both students and classroom teachers).

Interactivity, dialogue and critical reflection in open and distance education has been fundamental to the theoretical work of Evans and Nation (1987, 1989a, 1989b, 1992) who mounted a critique of the dominant paradigm in distance education theory and research, which they refer to as 'instructional industrialism'. They argue that 'instructional industrialism' rests on: a reliance upon learning theories derived from behavioural psychology, which assume that students are best served by programmed learning texts; a belief that many of the communication requirements of teachers and students in distance education are provided by simplistically and uncritically adopting new technologies; and an insistence that distance education is most effectively carried out in large 'industrial' organisations which can exercise economies of scale. Educational technologies however, can be used in ways which encourage dialogue and participatory forms of learning, and which can support and enhance the teacher as professional. To do so requires programs that are designed to foster such, and also requires complementary understandings and actions on the part of the local teachers (and learners) (see Walker, 1993). Arguably, this has broadly been the goal of SOFNet in that it has used interactivity as a technical feature of the media, it has designed programs to encourage children to be both active and interactive in their learning, and it has encouraged teachers to understand these features of the SOFNet programs and to integrate them into their practice.

Research Design

The research used qualitative research methods to develop case studies of the implementation and use of ITV in the selected schools in Victoria, with two mini case-studies being conducted interstate in the first year of the study, for the purposes of comparison and contextualisation. For the main case-studies, five primary schools were selected, including two rural primary schools, and three metropolitan schools including two non-government schools. In each primary school ITV case-studies were conducted simultaneously over a school, split between the main curriculum areas (Science and Technology, and Languages other than English).

Forty primary school observations of ITV lessons were carried out between April and December of 1998. These observations were recorded by either written notes and transcribed later, or by recording notes on a laptop computer which were extended later. Typically, the ITV lessons were only part of the timetable for the particular curriculum area and, where possible, in addition the children's learning 'off-air' in other sessions were observed. Sixty-four students in groups of two to six were interviewed and invited to discuss their responses to learning via interactive television. These interviews were conducted in a room or secluded space at the school and were tape-recorded and transcribed. Eighteen teachers were also interviewed (tape-recorded and transcribed) in addition to contributing to regular discussions during school visits of which notes were made.

Using the transcriptions of observations and interviews, together with the other material collected, the data on primary schools has been reviewed to identify key themes that emerged. This paper is based on the first stage of this analysis for the primary school children.

Preliminary findings of the first phase of the research

Interviewing children and observing them in classrooms can be both a fascinating and tedious affair. Much of classroom life, with or without interactive television, seems unremarkable, until something occurs which seems beyond the routine. However, the routine in classrooms is noteworthy for the researcher because, drawing on Giddens (Giddens, 1984; Giddens and Pierson, 1998 pp.75-87), it is through the recursiveness of such social life that structures and meanings are (re-)embedded. In our case, to what extent are the already embedded learning practices of children disrupted and 're-embedded' through the use of ITV. Indeed, one matter that occurred to us at the start was the extent to which already embedded television viewing and telephone communication practices would be disrupted and re-embedded within their learning practices, thus reconstructing their learning practices in ways which usefully incorporated ITV as a learning medium. We plan in our subsequent analysis for a later publication to explore these matters.

In addition to observing the routines of ITV classes, we also observed and recorded particular instances that might be peculiar to ITV. In reviewing our observation notes, we then structured interviews (or more properly 'conversations') with the children around particular themes that emerged from both the routine and the particular. The youngest children interviewed were ages six and seven years old and the oldest were ten and eleven years old. In most cases to co-operate with school organisation and for the comfort level of the children, they were interviewed in pairs or small groups. The nature and extent of the interviews corresponded to the ages of the children. The social pressure of the group process had some effects during the interviews with the older children who tended to agree with the most outspoken and forceful members of the group. The themes outlined below represent the major ones we have identified from interviewing and observing these children.

Method of Analysis

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The effectiveness of this use of technology, particularly through the interaction provision within the ITV programs, was researched through analysing the interview responses of both students and teachers and through analysis of classroom observations. The children's comments about the interactive elements of the programs (even if their class was using a video-recording rather than watching the broadcast program and therefore was unable to phone the presenters) and to the programs' active segments were compared with the researchers' classroom observations to ensure a degree of validation to their responses. The teachers' management of the ITV programs, including the responses to interaction, and their preparation and follow-up of programs were analysed from observations of their classes and from the related teacher interviews when their full curriculum integration and curriculum and classroom management was discussed.

FINDINGS

The framework for the way ITV programs provided opportunity for interaction and dialogue emerged as consisting of three main elements:

Program design - The different curriculum content between the STEPS and PALS programs resulted in differing program design and time-allocations. These have been analysed separately and the classroom responses discussed below in relation to matters of program design. The range of activities designed to develop dialogue or interaction, whether overtly observable student-student or teacher-student interactions or whether embedded within the design to encourage the learner's internal dialogue, are analysed and described.

Interactive segments - The way the program presenters and the teachers have managed these segments is important to the effectiveness of this medium for learning. The children's responses to these segments, and the opportunities for dialogic process these segments represent, were an important focus of all the programs. The overall importance of these segments to the effectiveness of the programs will be discussed.

Teacher preparation and follow-up - These elements of the programs are important to the understanding of the impact of this technology to student learning. Sharing a common conceptual understanding of an area of content with visual, audio and active shared experiences to suit all learners, meant that the teachers' lessons were a different process than an ordinary classroom lesson. The ability to construct a shared understanding was facilitated by these common learning experiences.

1) Program Design

The data gathered during 1998 shows that the current use of ITV in Victorian schools has learned from the research of the 1970s and 1980s into effective use of educational television and video (Bates, 1984; Crooks, 1990) in its integration of interactivity and dialogue into this medium. The structure of each program fits recommended criteria such as those of McMillan (1994) with clear messaging of the purpose and intent of each program, introduced and restated throughout a familiar structure by enthusiastic and genuine presenters who personalise the medium for the student audience. A variety of activities are provided to suit a range of learners and to encourage active learning, rather than passive responding. The programs are supported by preparatory and resource materials for the teachers which enable them to create an effective learning environment. Teachers using the programs were encouraged to provide comments and suggestions to the program makers through planned in-service days as well as through external evaluations carried out with program team response to teachers' suggestions for change (Deakin University CDU 1995, Marshall, Matthews & Oakley, 1996; Santoro and Oakley, 1998).

STEPS

In the Science and Technology in Primary Schools (STEPS) programs, the broadcasts have been carefully planned to keep the children involved, with interactive points for experimentation, with faxes and mailing of students' work sent to the presenters, and with specialist guests and participating invited children. Video-recorded material is interspersed throughout the program-for example, showing farms, factories, animals in natural environments and space exploration-as they are relevant to the program. The program scripts are designed to be entertaining as well as educational and are laced with humour (which is appreciated by the children). The design includes the presenters undertaking role-plays, cartoon segments and graphically enhanced explanations and summaries. Program segments are well-paced to maintain the children's concentration and to engage them in actively responding. The observations and interviews discussed below show the responses of the students to these planned and carefully timed sequences.

Out of the seven schools in the study, four were using the STEPS programs. One rural school and one metropolitan school used the program live and frequently interacted with the program team. One metropolitan school video-recorded the program but then watched the program reticulated simultaneously through a network of three classes at a time close to the actual broadcast. This meant that the program could neither be used interactively with the presenters, nor used as videotape with opportunities for pause and review. The weekly sequence was maintained at this school so that work was faxed to the presenters and reported back in later programs. One metropolitan school video-recorded the programs and used them at a time convenient to the teacher's timetable. This meant that the program was used, often several weeks after transmission, as if it was an educational video. Hence, the various forms of synchronous and asynchronous interaction with the program presenters were removed.

A STEPS program at 4 levels (taking 30 minutes non-interactively in Preps and in grades 1/2 and 1 hour interactively at grades 3/4 level and grades 5/6 level) followed a typical format of:

- Review/snippets of previous program

- Outline of current program

- Information and discussion with presenters (and sometimes guests or visiting students)

- Demonstration or video clip

- Activity or worksheet for student response and interaction

- Guest

- Demonstration or video snippet

- Investigation or similar activity

- Interaction by phone or facsimile (with presenter and/or guest) of approx 15-17 minutes

- Follow-up Activity/worksheet to be completed after the program.

The 1998 topics covered at grade levels were:

Year Level	CSF Level	Term & Topic			
		1	2	3	4
Prep	1	Me	My home	Celebrations	The Farm
1 & 2	2	Water, Water	Putting on a show	Celebrations	The Farm
3 & 4	3	Earth from space	Listen to that	Recycling	Farming the land
5 & 6	4	Plants	Energy	Inventions	Space Exploration

The STEPS web site (http://www.sofweb.vic.edu/steps) was available for program planning information as well as for follow-up work through further activities for student interaction.
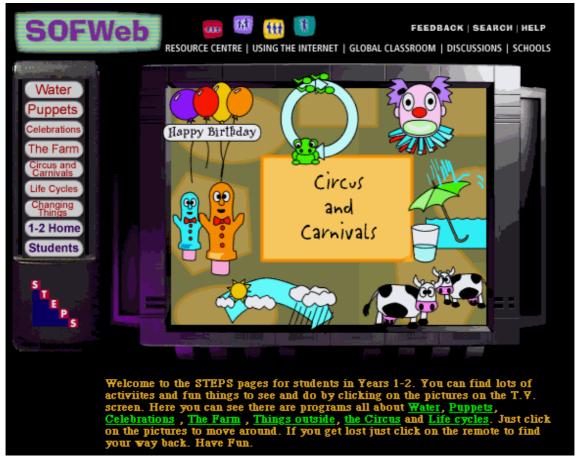

Figure 1: STEPS web page 1999 for grade 1-2.

The team developing the STEPS programs invited teachers to provide regular comment and evaluation on what works most effectively with students. Thereby, the team has designed programs that kept most classes involved in a dialogue, either virtually or actually, with the

presenters or each other. Session observation notes by the research team regularly included items of positive student responses to all the aspects of the program listed above as is exemplified in the following note:

> Once again the children listened intently to the program and carried out the activities as instructed by the presenter. No activity was met with a negative response. (Grade 4 metropolitan school).

A questioning element in the program design, which develops a shared dialogue, is embedded in the program format and described in the observations. The following descriptions are representative of observations of the STEPS programs:

> 2:16 The presenter poses a question for the students to think about in their class. The students discuss the question loudly amongst themselves with no prompting from the teachers. When the program resumes and the correct answer is given, the children cheer.

> 2:17 Another question is posed to the students. They discuss it amongst themselves and get excited when they are again correct. (Grade 5/6 metropolitan school)

The approach in the program is very much about question and answer. The questions may be put to the guest, the children, presenters, or they are questions reflected on by the presenters themselves. This can be seen as a form of structuring classroom interaction through the program design. This is sometimes framed within the traditional scientific method where the children as asked to predict or to hypothesise why something is the case, and then to suggest how this might be tested scientifically.

When interviewed, the students commented favourably on the STEPS program format. They particularly liked seeing other students in the studio interacting with the presenters or guests. Observations consistently showed that children's interest in the program was heightened when other children were on the program, whether live in the studio or in a video clip at their school or elsewhere. It seems that this was vicarious interaction that occurred through viewing the interactions of other children. One child stated in an interview:

> Well it's good when they bring children in from other schools because it's much more interesting when they actually have children doing the tests and talking about it and everything...(Grade 4, metropolitan state school).

The effectiveness of the program design as a dialogic tool depended to a great extent on the classroom management style of the teacher. Teachers of two of the year 3/4 or 5/6 groups were observed to encourage less overt interaction between the students in the class and the presenters because they would not allow any discussion during the broadcast unless it was teacher initiated and controlled. Partly this was due to the physical confinements of the classroom where classes (sometimes two classes together) were sitting on the floor in front of the television set and were unable to all talk together or even work on worksheets interactively. However all observed teachers used the embedded designed question points in the program design to address questions directly to their class groups, often ignoring the televised interaction and encouraging dialogue amongst their students about the content that had been shared by the class through the program.

PALS

The PALS programs have different presenters for each of the languages offered, although the production teams work together to produce programs which followed a similar theme and format in each language. Themes in the 1998 programs observed included celebrations/festivals, weather, the home, food, holidays, pets and animals. At the primary level four languages are offered: French, German, Indonesian and Italian at two levels - beginning (grades 3/4) and continuing (grades 5/6). The research observations included two country schools learning Indonesian at beginning and continuing levels, and one metropolitan school also beginner level only. Observations also included beginning and continuing Italian at a country school and an interstate country school learning French at both levels.

The teachers and children were less enthusiastic about the program design of the PALS programs and they complained more about the presenters (though this varied with the specific language team). There was a less responsive cycle of evaluation and comment between the teachers and ITV teams, and the frustration with this had resulted in some of the teachers treating the lessons as passive television viewing. Schools who regularly interacted live were much more positive about the programs and were more prepared for the dialogic design elements as they had practised their language regularly.

The programs ran for 30 minutes and a typical format could include:

- Introduction

- Language point

- Language point in action (eg. Video clip, asked questions)

- Language point (eg. Demonstration, role play)

- Presentation/or activity (eg. Game, craft activity)

- Interaction

- Presentation

- Language point/or activity

- Interaction

- Close

The program design elements, through a mixture of entertaining activity and interaction able to promote a dialogue as with the STEPS programs, relied more on the capability of the PALS supporting teacher for their effectiveness. Students with teachers who were not competent with the language being taught and who did not apply a timetabled preparation lesson as well as a regular follow-up lesson, were ill equipped for a dialogic process in an immersion language program. As one grade 5 rural student said:

> I don't like the part where they talk so fast. ...I get lost, like heaps of times because I'd understand a bit but then I'd just get lost cause it's really hard for me cause I don't know hardly anything about it and then so it's hard.

This was echoed by two grade 4 students from the same school:

> And they talk really fast so you can't understand it.
>
> And when they talk, cause they're not allowed to talk English on the program, you can't understand what they're saying, so you don't know what they're going to do... we understand some of the words but not most of them.

If children were in classes that had not spent preparatory time practising the vocabulary required for their language program, it meant that when they were given a chance to join in a song or answer the presenters' questions, they were inactive and watched the television program passively. Though they commented on enjoying the games and the songs and the cultural segments (these were in English which they appreciated), the process of learning through dialogue was much more difficult without a sequence of lessons supporting the ITV programs.

2) Interactive segments

Within the seven case studies, five schools were interacting live with the programs and two schools were videotaping the programs for later use, while one school did both for timetable efficiency. The 64 children interviewed all responded positively to the interactive elements of the program whether they participated live or not. In both STEPS and PALS programs, they showed interest when other children participated or phoned into the program, and they also liked to see their work on screen with references made to their schools. They enjoyed the live interaction if their school phoned the presenters and they talked about feeling proud to be broadcast live. They recognised that it personalised the learning and enabled them to interact with experts and receive their advice. Inevitably when asked how the programs could be improved brought a suggestion for more interaction.

> I enjoy the interaction because you're actually kind of getting involved in it...You find it [the interaction] good because you can talk to French people and they know what they're doing... And they kind of help you a fair bit as well. (Grade 6 Student, rural primary school)

As with the impact of the program design, the interactive segments' effectiveness relied to an extent on the teacher's response to the segment and the way this was managed. The dialogic process is enabled by the interactive element but this is handled differently in different contexts as it is also a classroom management process, which varies with the physical context of the classroom and the teacher's management style. In some cases two classes are sitting together on the floor watching the program on a small screen television and this limits the number of students able to interact during the program. Acoustic feedback between telephone and television, meant that during this form of live interaction the television sound volume must be kept low if the telephone is used in the classroom, which reduces the class's quality of interaction. Often the interacting children leave the room and phone from a corridor or another room which removes the interaction away from the class, although often they are class developed questions being asked. Students complained of the problems in this process in their interviews but were still all excited about interacting and talked of the way the other children participated by answering questions aloud even if they weren't phoning the program team. Some teachers are less encouraging of classroom dialogue at the times when their students are interacting by telephone, as this is a moment when their school is in the spotlight and they didn't want the children interacting to be distracted by the rest of the class.

> We have to be really quiet during the program...unless we're told to write she [the teacher] won't let us write or talk too someone, discussing things. (Grade 4 Student, metropolitan school)

However, teachers who use the programs interactively have talked about the impetus and momentum provided by the programs' interaction (Evans, Stacey & Tregenza, 1999, p. 115) and this affects the students as well. When asked their opinions about the projected change to video the children were negative and typical responses were:

> Student 1: It would be a bit boring.

> Student 2: Yeah it would be more boring cause you'd just be watching.

> Student 3: It's sort of fun ringing up. (Grade 5/6 students, rural school)

Interactive points are particularly motivational, an impetus, and a time stucture which provide a focus for all students to hold their own internal dialogue as well as a dialogue within the class. All students are focussing on the ITV interaction, whereas in class they can often be focusing elsewhere and not sharing a common experience. The immediacy of focus on interaction and the motivation of preparing a response improves the importance and quality of this shared experience.

> ...that's [the interaction] probably where I learn the most. I don't think it's fun just sitting and watching because sometimes it gets a bit boring, but when you're talking to somebody, then it's kind of more exciting. (Grade 6 Student, rural primary school).

The significance of the interactive segments to student learning can be understood from a social constructivist perspective. Vygotsky's notion of a *zone of proximal development*, a zone in which a learner cannot yet achieve an understanding of a new concept alone and requires help from a teacher or a peer:

> It is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers. (Vygotsky, 1978, p. 86)

Such a concept requires a learner to interact with other learners who will extend their understanding. Group interaction in the learning process is an important requirement for this condition and the problem solving in interactive segments provide students with guidance and feedback. It also enables Vygotsky's notion of *scaffolding*, in which learners are given a great deal of support initially and then encouraged to become more independent and responsible for their learning as soon as possible. The interactive segments provide access to question experts and this was acknowledged by many of the students.

> Whereas when it's live, you can ask the presenter a question and get the answer to it straight away. (Grade 3/4 Student, metropolitan school)

Post Vygotskian researchers explored these ideas and found that school activities that employed a collaborative problem-solving approach had the potential to teach children to deal with complex tasks and to work with and learn from one another and provide long-term outcomes (Forman & McPhail, 1993). If the interactive segments were managed well, this was possible to achieve in watching the ITV programs. Observations of the same STEPS program with one class that watched the program video-recorded and one that interacted live showed a contrasting engagement with the program when it was viewed live and a contrasting teacher management of the program. Whereas students in the video-recorded program tended to lose concentration and were unresponsive to elements of the program's design with the interactive segment of only passing interest, those interacting live were

actively focussing on the whole program and responding to questions throughout. The students interacting were able to actively engage in the problem solving activities with all materials prepared, whereas the video watching class were not so prepared.

The video-recorded program took longer to watch than the time programmed as the teacher could delay interactive points, rewind for review and extend discussion. Depending on how the teacher used this time, a discussion can be effective as it extends the dialogic component of the program and if activities are prepared beforehand as the program notes specify, the session can still be an active learning session. However if activities are not prepared and the interactive element is used only as a lengthy teacher directed class discussion as was observed, the children can lose focus, be much less engaged and learn less effectively with the program.

3) Teacher preparation and follow-up

The programs in both series provided the teachers with well prepared resources for integration of the ITV programs into their classroom curriculum, with suggested lessons both before and after the broadcast. The preparation and follow-up to the programs is a major part of their effectiveness as a medium for constructivist learning. The program provides a central shared experience for all students within which the dialogic process enables them to construct their own conceptual understanding. As learners have interaction and feedback from presenters, teachers, other students, either near or remote via the broadcast, the social constructivist process of scaffolding is possible. Researchers who continued to explore Vygotsky's theories with new research, re-theorised cognition postulating that when two people worked on a task, whether by talking to one another or solving the same problem, the critical point was not so much the individual's understanding as the presence of shared meanings or *'intersubjectivity'* (Goodnow, 1993, p. 374). The ITV program represented a shared context that enabled such meanings to be developed if the teacher provided an ongoing sequence of lessons around the ITV broadcasts. Particularly if the classroom management of the teacher allowed little interaction and active learning within the broadcast period itself, the use of lessons following and preparing for the ITV programs are even more important for the students to learn most effectively.

Students in remote areas in particular often have fewer possibilities for the variety of experiences offered by the videoed segments, guests and active experimentation that the programs presented. If the teacher prepared the class for the interactive television program, so that they could actively and confidently participate, the shared interactive viewing experience provided the potential for social constructivist learning. A shared means of communication is also essential so that learners are able to argue or share ideas and work collaboratively together and make collaborative learning a meaningful learning process. Active group learning as suggested in the science activities and the games and follow-up worksheets in both STEPS and PALS, which the students completed after learning new vocabulary and concepts, provided an appropriate environment for learning as the teacher and other students provided a range of social interaction and differing perspectives in post program discussion. In one observation, the students followed the program about growing cereal crops with small group activities that actively demonstrated their learning:

> **Observation: Post ITV lesson** (broadcast is the shared focus of the continuing dialogic process) Teacher has them 'put thinking caps on' asks children what they can do in way of experimenting -children reply about fair testing (have listened well), grinding, growing grain.

> Groups report back after applying the concepts they've learned and
> responding to the activity ideas in the program. Dialogue and interaction
> about shared focus of program
>
> Teacher questioned them about grains and they seem to have been learned
> about these from the program and discussion. Program content not
> completely understood and remembered but has raised questions and
> interest and the children seem confident they will find information needed.
> (Observation, Grade 4 metropolitan school).

Teacher's attitudes to the value of the program were also important - three students from a
school where their teacher was quite negative towards the programs and conveyed this
during her classes, commented that the PALS programs were 'boring' and these were
students who were unprepared and unable to participate fully in the interactive broadcasts.
Their classrooms viewed the programs passively without the preparation and background
needed and were subsequently not as effective a medium for learning the language.

CONCLUSION

Through a preliminary analysis of the research data we have collected, the process of
student learning through the mediation of interactive television has been discussed. The
effects of ITV from the perspectives of the students observed and interviewed in this study
have been explored in this paper and some conclusions can be drawn. The programs were
found to provide a shared context and focus for learning for the students, particularly when
the components of interaction and dialogue embedded in the programs were all used
effectively. ITV programs have been designed with a range of activities which, if managed
well, can provide points of dialogue, and possibilities for active and interactive learning.
Evaluation and other comments about ITV programs from teachers about their students'
engagements and learning, has contributed to improvements and refinements to the
programs, such that they may be seen as engaging, educative and entertaining for the
students. Interactive segments, if prepared well and organised well in the classroom
environment, have focused the students on the programs in a way normal classroom
lessons cannot do. The wider network of students and experts that enter a participating
classroom this way, provide motivation and shared meaning for later dialogue. Follow-up
classroom lessons, guided by the ITV resource guide and managed well by classroom
teachers, became a powerful environment for a social constructivist process of learning.

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