

DISTANCE TEACHING VIA VIDEO-CONFERENCING IN NEW SOUTH WALES SCHOOLS: STUDENTS' AND TEACHERS' PERCEPTIONS

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INTRODUCTION

The use of interactive video-conferencing in the delivery of secondary education is a relatively new innovation in Australian secondary education. The use of video-conferencing in industry especially for executive level meetings in large corporations has been around much longer. The Department of School Education in Victoria has used video-conferencing since 1995 (Arms, 1998a). State departments of education in Tasmania, South Australia and Queensland have also examined the ways in which video-conferencing can be incorporated into their modes of delivery. More recently, the New South Wales Department of Education and Training has examined the potential for video-conferencing as a means of delivery of senior secondary subjects to students attending small rural schools.

THE USE OF TECHNOLOGY FOR RURAL EDUCATION DELIVERY IN NEW SOUTH WALES

The New South Wales Department of School Education in 1989 released the *Rural Schools Plan* (Metherell, 1989) and followed this with the *Rural Education and Training Plan 1994-1997* (Chadwick, 1994). One of the focus areas in these policy documents which had a lasting impact on rural New South Wales schools was embodied in this stated objective:

'to improve access to education for all rural students and to reduce educational disadvantage caused by isolation'

Following the release of the initial policy document, the Department of School Education responded quickly through the creation in 1990 of two pilot access programs which used technology for delivering senior secondary subjects to students in small central schools. These were: i) Riverina Access Program; and ii) Western Region Access Program.

Both access program commenced operation with a range of telephone line based communication facilities including a voice link (a loud speaker teleconference system), a document link (a facsimile machine), and a computer screen link (a macintosh computer running Electronic Classroom software) which was called telematics initially but now known as audiographics. This audiographics system has expanded over the years. In 1998, audiographics delivery is used as the main means of delivery of Years 11 and 12 subjects in 5 rural clusters with 21 participating central and high schools.

IMPETUS FOR VIDEO-CONFERENCING IN NEW SOUTH WALES

During 1996, the Principal at Ardlethan Central School visited a number of small rural schools in the United States of America where he observed and reported on the use of video-conference systems for delivery of the senior curriculum (Farrell, 1997). Video-conferencing was perceived

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to be the next logical step in the application of technology to improve instructional delivery of the curriculum for the Riverina access cluster schools. The three Riverina access cluster principals received a grant from the New South Wales Department of School Education's Directorate of Distance and Rural Education in mid 1997 to establish a pilot program using video-conferencing as the primary technology-based means of delivery of the curriculum. This program commenced with the start of the new school year in 1998.

During term 1 and term 2 of 1998, several improvements in the video-conferencing system have occurred which are designed to improve its technical operational features as well as making it easier for staff and students to use in their classes.

THE RIVERINA ACCESS CLUSTER

The school sites at which the introduction of video-conferencing was trialled were members of the Riverina Access Cluster. Each school is located in the New South Wales geographical region known as the Riverina region. Since 1990, the Riverina Access Program has been at the forefront of innovative distance education delivery approaches in New South Wales. This cluster consists of three K-12 Central Schools:

Ariah Park Central School;
Ardlethan Central School; and
Barellan Central School.

Ariah Park Central School is located in the village of Ariah Park which, with its surrounding farming community, has a population of about 400. This school is 30 kms to the east of Ardlethan. The School has a current enrolment of 172 with 75 students in the secondary section plus 6 full-time equivalent mature aged students. At the time of this study there were a total of 12 students enrolled in Years 11 and 12.

Ardlethan Central School is located in the township of Ardlethan which has a town population of about 500. Ardlethan Central School is the hub school in that is equally distant from both Ariah Park to the east and Barellan to the west. Ardlethan Central School has a total school enrolment of 152 students and 61 students in the secondary section plus 3 full-time equivalent mature aged students. The Access Coordinator is located at Ardlethan. At the time of this study there were a total of 18 students enrolled in Years 11 and 12.

Barellan Central School is located 30 kms to the west of Ardlethan and is located in the town of Barellan which has a population of about 450. The school has a total enrolment of 140 with 48 students in the secondary section. At the time of this study, there were a total of 4 students enrolled in Years 11 and 12.

THE ORIGINS AND SCOPE OF THIS STUDY

Early in 1998, the Principals of the three Riverina access schools, the Access Program Coordinator and the Department of Education and Training's Distance and Rural Education Directorate commissioned an evaluation of the educational outcomes from using the video-conferencing system as the mode of delivery for the senior secondary curriculum.

THE FOCUS OF THE STUDY

Following initial contact between the access schools and the researchers, planning sessions were conducted via video-conference using the Charles Sturt University Picturetel system linking into the Ardlethan Central School's video-conference system. The researchers were requested to conduct a study on the educational effects on learning outcomes from using the video-conferencing system.

The overall focus of this study was identified as:

to examine the educational impact of video-conferencing on learning outcomes

More specific aims derived from this overall purpose for the study included to:

1. document the reactions of the participants to the use of video-conferencing as the means of delivery;
2. evaluate the effects of video-conference lessons on student learning;
3. document the types of interactions that occur between students and between teacher and students across teaching sites; and

LINKS TO THE AUSTRALIAN LITERATURE

The Victorian Department of Education introduced video-conference facilities into a number of its school clusters in 1995 that were exclusively using audiographics as the means of delivery. By 1998, video-conferencing was available in 48 Victorian schools. In the first semester of 1998, 37 teachers spread over 9 rural clusters comprising secondary colleges, high schools and P-12 colleges were using this mode of delivery (Arms, 1998a). Arms (1998b) confirms D'Cruz's assertion that teachers need professional support and training programs in the application of advanced technologies, like video-conferencing, if they are to become efficient and productive users of the technologies for the delivery of lessons. Specifically, she noted that as teachers moved from audiographics to video-conferencing as the mode of delivery there were significant implicit benefits. Arms (1998b, p. 5) stated:

Many teachers who have taught remotely, using Telematics are appreciating the capacity to see their students with full videoconferencing and have reported that this sophisticated, yet in many ways simple, development has facilitated a greater 'esprit de corps' in the class than was possible with the less holistically visually oriented audiographics system.

She offered a cautionary note about distance education teaching strategies when she observed that no one mode of delivery is perfect for all students and all contexts. Rather she affirmed there will always be a need for multiple modes of delivery ranging from the video-conference through teleconferences to face-to-face meetings on site in specific situations. Arms (1998b) noted that the type of interactions and communications in lessons between students and between students and their teachers will vary. She suggested that 'the social discussion and chit-chat at the beginning of each on-line session, regardless of technology ... [are] an important part of the socialising of the distance education class and to allow the teacher to get to know his or her students'. (p.5)

This issue of interactivity has been explored more fully by Oliver and McLoughlin (1997) who observed that audiographics teleteaching is widely used in the Australian context for solving the problem of providing curriculum delivery in rural and remote locations. These authors reported that in their research on the nature of interactions occurring the audiographics lessons 'audiographics teaching fails to take full advantage of the many forms of interactivity that may be supported. The forms of interactivity most commonly employed in lesson delivery appear to be used primarily for management, communication, and student engagement' (p.34).

These authors conducted a detailed analysis of the interactions occurring in upper primary level audiographics lessons using a two dimensional framework in which one axis represented the five types of communicative interaction occurring in a lesson (social, procedural, expository, explanatory, cognitive) and on the other axis the originator of the interaction (teacher or student). Their results clearly revealed that 61.2% of all classroom communicative interactions were i) teacher initiated, ii) directed to the whole class, and iii) predominantly expository (73%) and procedural (24%) in nature. These authors concluded 'When control of the communication resides primarily with one person, interactivity is lacking and the exchange becomes a monologue thus diminishing the potential outcomes from the communication.' (p. 50). Their findings on interaction in lessons delivered at a distance have direct application to the present study where teachers and students are changing from audiographics to video-conferencing as the instructional delivery medium.

As with any form of change in professional practice, teachers respond in different ways. Often they may feel threatened by the innovation or they may welcome it without questioning the manner in which it is implemented or the effects it may produce. To reduce many of these problematic issues as they relate to distance education, D'Cruz (1990) examined a number of these issues in his evaluation of distance education and its focus on telematics in Victoria. In particular, D'Cruz (1990) produced a series of recommendations that, from a systemic viewpoint, can address the concerns raised about innovation and change. Four of his twelve recommendations related to the professional development and training needs for teachers working in a distance education setting. These recommendations were:

- i) state-wide policy development to provide professional development for distance education;
- ii) inservice training for principals in the cost effectiveness analysis of providing alternate learning/teaching structures;
- iii) encouragement of inservice training in the use of delivery systems, such as telematics; and
- iv) organisation of a bi-annual conference for distance education teaching and learning research, evaluation and discussion.

Sandery and Lundin (1993) also commented on the professional development needs of distance education teachers. They argued that the appropriate use of distance education technologies should be used to effectively deliver the desired and most urgent teacher professional development needs. Their vision for these programs was the formation of 'learning communities' within schools.

Focussing on studies reporting on the outcomes of research into the impact of the use of distance education technologies, a number of studies were identified. These are briefly reported below:

- i) Boylan (1992), Walker and Boylan (1992), Squires, Sinclair and Bell (1991) and Squires and Sinclair (1992) have documented the impact of telematics on small rural central (K-12) schools in New South Wales; and

- ii) Boylan, Squires and Smith (1994) and Tuovinen and Boylan (1993, 1994) have documented the use of audiographic teleteaching (Telematics) in the pre-service teacher education courses on both the Bathurst and Wagga Wagga campuses of CSU; and
- iii) Oliver and Reeves (1994) evaluated the instructional effectiveness of telematics for the delivery of specialist programs for students in rural Western Australian schools. In their conclusion, Oliver and Reeves (1994, p 122) encapsulate in this final statement their findings about telematics as a distance education technology:

'Telematics teaching is a powerful and flexible delivery tool that has the capacity to significantly lessen the disadvantages suffered by rural students in access to specialist education programmes'.

To guide the development of questionnaires to be used in this study, available Australian literature on audiographics and video-conferencing was examined. In particular the work of:

- i) Boylan, Squires and Smith (1994) and Tuovinen and Boylan (1993, 1994) were used for the development of the surveys and interview schedules for the students and teachers; and
- ii) Oliver and Reeves (1994) were used for the development of the part 2 teacher survey, and interview schedules for the school principal and Access Coordinator and teachers.

THE DATA COLLECTION PROCESS

The following participants were identified for inclusion in the study: i) all teachers of Years 11 and 12 classes including the Access Coordinator; and ii) all students in Years 11 and 12.

To gather this information, the study has used:

- i) written surveys which were completed by all Year 11 and Year 12 students at each Access Central school;
- ii) written surveys which were completed by teachers at each school who were currently teaching a Year 11 and / or Year 12 class via the video-conference system;
- iii) structured interview schedules developed for the small groups of Year 11 students (size of group ranged from 2 - 4) and for separate Year 12 students groups (size of groups ranged from 2 - 4); and
- iv) structured interview schedule developed for the teachers of Year 11 and / or Year 12 classes.

The data were collected in late April 1998 through to mid June 1998.

THE FINDINGS

The students

The findings from the data collected from the students through both the surveys and the interviews with small groups of Year 11 students and repeated with Year 12 students are reported here.

1 Student survey

The student survey consisted of two parts. Part 1 comprises questions about student biographies, perception about using the equipment, features of video-conferencing, perceived advantages and disadvantages of the video-conference system, their views on recommending the system for future years at their school. Part 2 consisted of 13 likert scale items about teaching and learning issues with video-conferencing.

Biographical information.

34 students provided useable responses to the written survey. The distribution of students enrolled at each school by year of study is shown in Table 1.

Table 1

Distribution of Senior Students

Students Schools	Year 11 Males	Year 11 Females	Year 12 Males	Year 12 Females	Omitted	TOTAL
Ardlethan C.S.	5	3	2	7	1	18
Ariah Park C.S.	4	6	1	1	0	12
Barellan C.S.	0	2	1	1	0	4
TOTAL	9	11	4	9	1	34

Equipment operation

Students were asked to rate the ease of operation of the video-conference equipment on a five point scale (very easy, easy, not sure, difficult, very difficult). When the 'easy' and 'very easy' categories were combined into a 'relatively easy' category, overall, all component parts of the video-conference system (voice link, computer link, video link) were rated as relatively easy to use by most students.

Specifically the operation of:

- i) the voice link was relatively easy for 30 or 88% of all students;

- ii) the computer link was rated at relatively easy by 24 students (71%);
- iii) the document link was relatively easy to operate for 25 students (74%); and
- iv) the video link was rated relatively easy by 21 students (62%).

On this item there was a group of 11 students (32%) who were 'not sure' about the operation of this component.

Teaching and learning features of video-conference system

Students responded to eight likert scale item about specific features of the video-conference system and how important they were to each student (ie. 'extremely important', 'very important', 'moderately important', 'slightly important' and 'not at all important'). When the 'extremely important' and 'very important' choices are combined into a 'really important' category, then:

- i) 23 students (86%) found seeing students at the other school was really important;
- ii) 28 students (82%) stated listening to students at the other school was really important;
- iii) 24 students (71%) also stated that listening to students at the their school was really important;
- iv) 24 students (71%) stated that talking to the students at the other school was really important;
- v) 22 students (65%) also stated that talking to the students at their school was really important;
- vi) 22 students (65%) stated that communicating by text on the computer was really important;
- vii) 26 students (76%) stated that the communication by video images was really important; and
- viii) 20 students (59%) stated that communicating by graphics on the computer screen was really important.

Advantages and disadvantages of the video-conference system

Two open ended question were included that asked students to provide their views on the perceived advantages and disadvantages of the video-delivery of lessons.

32 students provided a total of 49 written statements in response to the question about the advantages of the video-conference system. Their responses were categorised into a number of categories which were:

- i) creating a whole class identity - 22 statements. eg. *Being able to see the teacher, and other students; Seeing your classmates and teachers; We have combined three schools; You can see your teacher and the other students who are in your class and talk as if you are in the same room.*

- ii) improved learning - 12 statements. eg. *The teacher can show students texts or even use body language- all helpful; Understand the work better if you can see the teacher telling us; learn from other schools how they interpret things.*
- iii) improved communication - 7 statements. eg. *Also to be able to communicate with your teacher if at another school; Closer communication with other students; To talk to the teacher.*
- iv) using technology - 4 statements. eg. *Use the whiteboard to explain things better and take notes; Using computers more.*
- v) other comments - 4 statements. eg. *Offering different classes.*

31 students provided a total of 38 written statements in response to the question about the disadvantages of the video-conference system. Their responses were categorised into a number of categories which were:

- i) technical problems with the system - 21 statements. eg. *Can get faulty eg. link, speakers etc.; Could be something wrong when linking up; Does not work all the time-minor problems; Doesn't work sometimes; Having problems with the line; If the computer breaks down you can't link up. When all 3 schools are linked together we can't see Barellan as the picture stays on Arian Park.*
- ii) a teacher contact issue - 8 statements. eg. *The teacher at the other school can see when you're not working; Teachers that are linked with other schools can't do anything if a student mucks up; No teacher in your own school for your subject.*
- iii) a training need - 5 statements. eg. *I don't know how to use it, it seems a bit frightening; Not sure how to connect up to other schools.*
- iv) other comments - 4 statements. eg. *In lessons such as maths it is difficult to explain certain things through video conferencing.*

Part 2 of the Student survey

Part 2 of the student survey consisted of 13 likert scale items ('strongly agree' to 'strongly disagree') about teaching and learning issues associated with video-conferencing. These items were drawn from the work of Oliver and Reeves (1993) and modified for a video-conferencing learning environment.

Teaching and learning matters

Responses from the 'strongly agree' and 'agree' categories on each item have been aggregated and are reported here. The 13 items completed by Years 11 and 12 are grouped into two areas. These areas are: i) instructional effectiveness; and ii) organisational support.

Instructional effectiveness

Within this group of items, more specific attributes of instructional effectiveness were identified. These were:

- i) relationships. 25 students (74%) agreed with the statement that 'My video-conference teachers really know who I am'. 25 students (74%) agreed with the statement that 'Video-conference lessons promote positive student-teacher interactions'.
- ii) communication skills. 28 students (82%) agreed with the statement that 'Video-conference lessons demand strong communication skills from the student'. 25 students (74%) agreed with the statement that 'Video-conference lessons must involve an appropriate mix of teacher-led and student-led communications'.
- iii) evaluation. 26 students (76%) agreed with the statement that 'Teachers can evaluate and monitor my learning in a video-conference lesson'.

Organisational support

Within this area of the survey, items were presented which sought students' opinions about organisational support matters. These were categorised into two sub-groups which were: i) school level support; and ii) training and development.

- i) school level support. 18 students (53%) agreed with the statement that 'The video-conference teaching rooms are well set up' while 9 students (26%) disagreed with this statement.
- ii) training and development. An equal number of students (14 or 41%) agreed with the statement that 'When video-conference lessons were introduced, the students were given good training programs on how to use the equipment' as those who disagreed with this statement.

These likert scale items were followed by two open ended question that asked students:

In what ways do you think your learning has been changed by the use of video-conference lessons?

and

What effects have the use of video-conferencing had on your commitment to study?

20 students responded to the first question. Their responses were grouped into three areas dealing with:

- i) effects on their learning - 10 statements covering aspects dealing with enhanced rate of learning, change in learning style, becoming a more independent learner. eg. *I learn a lot more in a lesson. I'm understanding more; It's a completely different style of learning. I'm used to learning face to face. My learning has changed because it makes you more independent and pushes you to get your work done.*
- ii) enhancing communication and interaction skills - 8 statements. eg. *More communication with teachers and students from other schools. More interaction with teachers from other schools benefits learning.*
- iii) more effort in studying - 4 statements. eg. *I have more work to do during the lessons and for homework and therefore I am achieving more; We seem to be doing more work.*

11 students responded to the second question. Their responses fell into two categories which were:

- i) commitment had increased - 7 statements. eg. *Encouraged more study- harder to avoid set work as the teacher can see if you have /haven't done it; I get a lot more work done in class and in study periods; I feel I have to work harder. Our teacher can see if we're working or bumming around.*
- ii) no effect - 4 statements. eg. *It hasn't had as much effect on my study as I thought it would. None.*

2. Student interviews

All students were interviewed in small group situations (range 2-4). A number of questions were asked of the students. These included:

What type of video-conference lesson do you like ?

Students responded in a variety of ways to this question, but broadly they liked the personal interaction with the teacher and students at other sites.

Some specific responses included:

Discussion - especially when they (the student) get involved
Listening to others' point of view
getting to know the others has been good
almost like being in a classroom - teacher makes you work (not like telematics)
good to be able to see other students' work
I understand things heaps better
Some lessons the teacher just talks - gets a bit boring

What types of interaction between students happen in video-conference lessons?

Students recognised the interactions both within and between sites as important and part of the learning. Some specific comments included:

Relationships have changed - it is like a big class, not them and us (almost unanimous comments in this area)
Some subjects interaction is more than others - maths everyone talks to each other - feels like a class
I like sharing ideas with others, especially those at other sites
Social chit chat on Monday mornings is something I look forward to
Easy to ask questions in the video-conference environment
We really feel like one class now

What components of the technology do you use ?

The most commonly used components of the system by students were the voice and visual parts.

The Teachers

The findings from the data collected from the teachers through both the surveys and the individual interviews with the teachers are reported here.

1. Teacher survey

The teacher survey followed the same format as the student survey. It incorporated all questions present in the student survey plus additional teacher-specific questions about the video-conferencing system. The survey was administered only to those secondary teachers who were currently using the video-conferencing system as part of their teaching allocation.

Part 1 of the teachers' survey was identical to Part 1 of the students' survey. Part 2 consisted of likert scale items focussing on teaching and learning issues with video-conferencing as well as open ended questions designed to provide information on the effects of video-conferencing on the teaching process, student commitment to learning and their experiences with using the system.

Biographical information

16 teachers provided useable responses to the written survey. 8 respondents were from Ardlethan, 4 from Aria Park, and 4 from Barellan. 9 respondents were female teachers, with the remaining 7 being male teachers. The distribution of teachers at each school by gender is shown in Table 2.

Table 2

Distribution of Teachers

Schools	Teachers Male	Teachers Female	TOTAL
Ardlethan C.S.	5	3	8
Aria Park C.S.	2	2	4
Barellan C.S.	2	2	4
TOTAL	9	7	16

Equipment operation

The teachers were asked to rate the ease of operation of the video-conference equipment on a five point scale (very easy, easy, not sure, difficult, very difficult). The 'easy' and 'very easy' categories were combined into one aggregated 'easy' group in the same manner as reported with the students, the overall view expressed by the majority of teachers (at least 11 or 69% of the teachers) was that all component parts of the video-conference system were rated as easy to use.

Specifically the operation of:

- i) the voice link was relatively easy for 15 or 94% of all teachers;
- ii) the computer link was rated at relatively easy by 14 teachers (88%);
- iii) the document link was relatively easy to operate for 13 teachers (81%); and
- iv) the video link was rated relatively easy by 11 teachers (69%). On this specific item there was a group of 4 teachers (25%) who were 'not sure' about the operation of this component.

The teachers were asked to respond to eight likert scale item about specific features of the video-conference system and how important they were to each student (ie. Extremely important, very important, moderately important, slightly important and not at all important). When the 'extremely important' and 'very important' choices are combined into a single 'really important' category, then:

- i) all 16 teachers (100%) found seeing students at the other school was really important;
- ii) all 16 teachers (100%) stated listening to students at the other school was really important;
- iii) 12 teachers (75%) also stated that listening to students at the their school was really important;
- iv) all 16 teachers (100%) stated that talking with the students at the other school was really important;
- v) 12 teachers (75%) also stated that talking to the students at their school was really important;
- vi) 8 teachers (50%) stated that communicating by text on the computer was really important;
- vii) 15 teachers (94%) stated that the communication by video images was really important; and
- viii) 10 teachers (63%) stated that communicating by graphics on the computer screen was really important.

Advantages and disadvantages of the video-conference system

Two open ended question were included that asked teachers to provide their views on the perceived advantages and disadvantages of the video-delivery of lessons.

Every teacher provided a response to these questions. In fact a total of 33 written statements in response to the question about the advantages of the video-conference system were made. Their responses were categorised into a number of categories which were:

- i) creating a whole class identity - 13 statements.
eg. *Can see the students working; Can see what's going on and reactions of students ie if they look confused; Combines the students from the three schools in a classroom situation; We can develop a rapport with our students, use eye contact, body language etc, the lessons are much more effective.*
- ii) improved learning - 12 statements.
eg. *Teachers are better able to evaluate student participation in lessons; Teaching students has become easier because I can see if they understand the information; You can see if students are on task or not.*

- iii) using technology - 4 statements.
eg. *One computer system does all the work instead of telephone, fax and computer; Students are technologically advanced.*
- iv) teaching lessons - 3 statements.
eg. *Overcomes the argument that access delivery is less than normal due to lack of face to face; The lessons are more like a real class situation.*
- v) other comment - 1 statement.
eg. *Provide a larger range of subjects to small schools.*

The 16 teachers provided a total of 27 written statements in response to the question about the disadvantages of the video-conference system. Their responses were classified into a number of categories which were

- i) technical problems with the system - 12 statements.
eg. *Not being familiar with all the features - but this will come with time; Not being supplied with all the equipment straight away; You need an appropriate room to make best use of this technology; Technical difficulties when they occur are challenging to teachers' confidence. Some feel 'lost' by this.*
- ii) a teacher management concern - 8 statements.
eg. *You can't control the camera at a remote site, so the students can focus it on whoever they want; Distance to travel to maintain contact with students. Time frame; Not being able to move around the room like in a general classroom; 2 x 40 minute periods per week is difficult to present 2 unit subjects.*
- iii) a training need - 2 statements.
eg. *The additional time taken to learn new skills and delivery method; May be putting more pressure on teachers who are already required to continually adapt to change.*
- iv) operational costs of the system - 2 statements.
eg. *Much more expensive setting up cost; Cost of line charges if over a long distance.*
- v) other comments - 3 statements.
eg. *At first I was very uncomfortable looking at myself; Potential use of this technology by the Dept of Education to cut back on their responsibilities to employ face to face teaching resources.*

Part 2 of the Teacher survey

Part 2 consisted of likert scale items addressing a number of teaching and learning issues associated with video-conferencing. These items were based, in part, upon the work of Oliver and Reeves (1994).

Teaching and learning matters

A five point likert scale ('strongly agree' to 'strongly disagree') was used to elicit responses on a range of teaching and learning issues. These are reported below. Responses from the 'strongly agree' and 'agree' categories have been aggregated and these aggregated responses are reported

here. The items were grouped into same two areas as reported for the student survey. These areas were:

- i) instructional effectiveness; and
- ii) organisational support.

Instructional effectiveness

This group of items addressed six more specific attributes. Three were identical to the students' survey (ie. Relationships, Communication skills, and Evaluation) while the remaining three were additional issues for teachers. These were:

- i) relationships.

All 16 teachers (100%) agreed with the statement that 'Video-conferencing teaching requires flexible learning environments that promote positive student-teacher interactions'.

15 teachers (94%) agreed with the statement that 'Classroom climates must be open and comfortable to promote student involvement and interaction'.

14 teachers (88%) agreed with the statement that 'Some physical contact between the teacher and the students is advantageous in developing student relationships'.

- ii) communication skills.

13 teachers (81%) agreed with the statement that 'Video-conferencing teaching demands strong communication skills from the teacher'.

10 teachers (63%) agreed with the statement that 'Compared to Telematics, the level of communication skills needed in video-conferencing are equal' while 6 teachers (38%) disagreed with this statement.

13 teachers (81%) agreed with the statement that 'Video-conference lessons must involve appropriate mix of teacher-led and student-led communications'.

- iii) evaluation.

11 teachers (69%) agreed with the statement that 'Student learning evaluation during a video-conference lesson is more effective than during Telematics teaching'.

15 teachers (94%) agreed with the statement that 'Evaluating and monitoring student independent work is essential in video-conference teaching'.

- iv) planning.

14 teachers (88%) agreed with the statement that 'Successful video-conferencing is dependent on a high level of lesson preparation'.

- v) teaching strategies.

12 teachers (75%) agreed with the statement that 'There is a need for more instructional strategies to be developed to support video-conferencing teaching'.

- vi) classroom management.

13 teachers (81%) agreed with the statement that 'Classroom management in video-conference lessons is more effective than in Telematics lessons'.

Organisational support

Within this area of the survey, items were presented which sought teacher's opinions about a range of organisational support matters. These were categorised into two sub-groups which were:

- i) school level support.

13 teachers (81%) agreed with the statement that 'Co-ordination between each school for determining the subject co-ordinator for each video-conferenced subject is important'.

13 teachers (81%) agreed with the statement that 'Video-conference teaching skills and techniques should be developed broadly across school curriculum areas and staff'.

- ii) staff training and development.

13 teachers (81%) agreed with the statement that 'There are areas about how to use the video-conference equipment that I would like more training on'.

14 teachers (88%) agreed with the statement that 'There are areas that I would like to learn more about successful ways of teaching via video-conferencing'.

Open ended questions

The 34 likert scale items were followed by three open ended questions which sought the teachers' views on the effects on student learning, the effects of video-conferencing on the teacher's teaching style, and finally a general question about video-conferencing.

The first question asked teachers to indicate how they thought their teaching had been changed by the use of video-conferencing. 13 teachers made a total of 20 comments which have been analysed into the following categories:

- i) improved planning - 6 statements.

eg. *Improved my preparation and communication skills; Organisational factors (having to be extremely prepared); Organisation and communication skills have had to improve; You need to be organised and have lessons sent down ahead of time eg. worksheets etc.*

- ii) greater range of teaching options - 6 statements.

eg. *Can show examples instantly and show how to use media over Video-conferencing; The students are more concerned about interacting; Development of different styles.*

- iii) better monitoring of students - 4 statements.

eg. *I can see if the students are understanding the information as we are discussing it. (This is saving time); You can immediately see how students are reacting to work presented.*

- iv) improved technical confidence - 3 statements.

eg. *Also, the more reliable link has encouraged me to use the whiteboard component and 'prepared screens' more regularly; Variety of programs and tools can be used.*

The second question asked teachers to identify the ways in which the use of video-conferencing had effected student learning. 15 teachers made of total of 29 comments which are classified into six categories as shown below:

- i) improved interaction between teacher and students - 8 statements.

eg. *A more interactive and thus accountable experience for the students compared to the [audiographics] Electronic Classroom program; students are more involved now that they can see the teacher and other students; The students ask more questions and seem more interested; The students feel more confident in asking questions and fore help.*

- ii) improved learning - 7 statements.

eg. *Increased knowledge and understanding of material; More independent learning, they have more responsibility in their own learning. Similar to university; Students are more on task.*

- iii) improved motivation to study - 6 statements.

eg. *[Students] enjoy using and learning about the new technology; More instant motivation; Students appear to be more motivated; Students appear to be more motivated by the improved technological support ie. they feel the schools have gone to lengths to provide a better system. learning experience for them.*

- iv) better classroom behaviour - 2 statements.

eg. *Students know they are observed while in class and cannot be distracted easily; The teacher can now see when students leave the room or are not paying attention.*

- v) improvements over the audiographics system - 2 statements.

eg. *A lot more positives than negatives as compared to telematics; It is much better than audiographics system.*

- vi) other diverse comments - 4 statements.

eg. *It also gives students opportunities to study subjects that they may not have otherwise had the opportunity to study; However, student learning sometimes suffers as I myself have troubles with Year 11 [class named] At Ardlethan, even though you can see the students it is still not the same as actually being there in the classroom; Not sure yet - only been doing it for about three weeks.*

2. Video-conference teacher interviews

Preference between video-conference teaching and face-to-face teaching

Most teachers, if given the choice, would prefer to teach in the face-to-face mode. The exceptions to this assertion were two teachers who had been long term users of electronic teaching who felt comfortable and confident teaching with distance/electronic modes. The video-conference innovation was seen to be 'closer' to face-to-face teaching and provided many positive benefits in the teaching of subjects, particularly where visual materials and images were important. The present organisation of two video-conference periods per week out of a

complement of 6 periods was seen as adequate by only a minority of teachers. Most teachers felt that 3 sessions (ie. 50% of available time) would be of significant value in improving the learning outcomes of students.

How does lesson preparation for video-conferencing compare with face-to-face and telematics?

Video-conference lesson preparation is similar to face-to-face lesson preparation. The visuals and teaching materials can be used the same way as in face-to-face classes. While preparation time was similar, the organisation component is more important in that materials and work sheets need to be prepared 2 days ahead to be sent to remote schools.

What forms of classroom management and teaching strategies do you use in video-conference lessons?

Responses here reflected significant differences in teacher style and curriculum area. The common theme amongst all teachers was the increased use and quality of discussion between teachers and students. Other strategies included structured reviews of worksheets/texts on the shared white board facility, brainstorming, keywords, definitions, diagrams, responses to visuals, debates, seminars.

Feedback and evaluation of student understanding through discussion and particularly body language was reported as one of the most significant benefits of the video-conference system over telematics. Engagement by all students is the other critical value added component of video-conferencing.

Management is not related to behaviour but to learning engagement. Distractions can be seen and attention redirected, all students are in the room and independent work can be checked and monitored. In most cases teachers felt that lessons were now much more student centred.

How much interaction do you have with students?

Teachers outlined two broad areas of interaction:

- i) Student - Teacher / Student - Student learning interactions. This area was seen as the most significant addition to the learning process as a result of the introduction of video-conferencing. Engagement, quality debate, group discussion, seminars and student initiated questioning have significantly enhanced the learning of the students;
- ii) Informal student - student interaction at the start of lessons as the teacher is arriving or getting organised. This social interaction, akin to the walk along the corridors in a normal school setting, has created a class coherence between sites that did not exist in telematics. It has replaced a 'them and us' mentality with a cooperative whole class feeling. This has improved motivation and the 'need' to get to class which was not seen in pre-video-conference or telematics classroom.

What do you think are the benefits for the students with video-conference

The following benefits were identified:

- i) confident computer users;

- ii) wider subject choice;
- iii) feeling of having a class to belong to;
- iv) independent learning skills; and
- v) good students can develop competition and interaction with other good students.

KEY FINDINGS AND CONCLUSION

Reactions of all participants to the video-conferencing system

The key reactions of the students and the teachers are summarised. The findings reported as a series of both positive and negative effects and outcomes.

The positives

- The majority of students reported that they found the technical operation and use of the video-conference system was easy. Similarly, over two-thirds of the teachers made the same affirmative statement about the operation and use of the video-conference system.
- Both students and teachers stated that the introduction of the video-conference system had created a number of significant advantages. These included the creation of a whole class environment where distance between schools became seamless.
- Both students and teachers also suggested that the video-conference system had led to improved learning outcomes occurring.
- Over 90% of students and 100% of the teachers stated that they would recommend the use of the video-conference system to others as a means of delivery of senior secondary lessons.
- All teachers recommended the use of the video-conference system as the preferred mode of delivery of distance education lessons.
- Most teachers stated that the addition of the visual component of the video-conference system had added an extra dimension to their distance education teaching that was not available with the audiographics system.

The negatives

- One area that both groups identified as a problem concerned the technical operational difficulties that had occurred during the first school term of operation and use of the video-conference system.
- About half of the students and two-thirds of the teachers stated that they needed more training and development activities on how to maximise their use of the video-conference system.

- The majority of teachers interviewed revealed that they would like more training on making better instructional use of the video-conference system both for lesson preparation and delivery purposes.
- The majority of teachers stated that the design of the video-conference room could be improved.
- Only half of the students believed that the design of the video-conference room was well set up.

The effects of video-conference lessons on student learning

There were a number of survey items and interview questions administered to both the students and their teachers that sought to evaluate the impact of the video-conference system on learning. These are reported here.

- From part 2 of the teacher survey, the majority of teachers' responses supported the assertion that the video-conference system was an effective and successful system for the delivery of distance education lessons. The teachers attributed this effectiveness and success to:
 - i) encouraging them to improve their lesson planning and preparation practices;
 - ii) the use of a greater variety of teaching strategies and diverse teaching materials in video-conferenced lessons;
 - iii) promoting more positive student - teacher interactions; and
 - iv) assisting with more effective classroom management practices than were available in the audiographics (telematics) system.
- About three-quarters of all students stated that the use of the video-conference system had improved student - teacher relationships.
- Feedback in the learning process is shown in the literature to be critical in terms of the quality of outcomes. Learning is maximised when feedback is provided in a variety of ways and is as immediate as possible. All teachers and most students indicated that the feedback process is now much more immediate and it has its sources in more diverse ways - namely body language, direct questions (student and teacher), monitoring student - student discussion, and in written forms. The quality of feedback is improving the outcomes of the learning in the eyes of students and teachers.
- Most students acknowledged and identified a number of important benefits for their learning derived from the video-conference system which were the positive effects this mode of delivery was having on :
 - i) the amount of lesson content covered;
 - ii) their better understanding of the lesson content; and
 - iii) the improved communication between their teacher and themselves.

- Most teachers affirmed that the video-conference system had led to improved teacher - student interactions in their classes and had led to improved student learning outcomes.

The types of interactions that occur between students and between teacher and students across teaching sites

- From the student interview data, it emerged that there was a significant change in perception among the students about their identity as a class as a result of the video-conference system. Previously, student informal talk and interaction was quite limited in audiographics lessons and the nature of the student talk that occurred was quite impersonal. Whereas in the video-conference lessons, students now saw their other class members, often for the first time, and engaged in regular social chit-chat before the teacher arrived in the video-conference room for the lesson. Collectively, these changes had broken down the 'us vs them' attitude that had existed before the advent of the video-conference system and had created a new sense of a whole class identity.
- All teachers were aware of and did actively encouraged the informal student - student interactions that were occurring at the beginning of lessons. The teachers stated that these interactions helped create the whole class identity that did not exist in the same way in the prior year with the audiographics system.
- The research on cooperative learning and classroom environments strongly suggests that positive student - student interaction enhances the quality of learning outcomes. The use of video-conferenced lessons has added this student - student interaction dimension to the teaching - learning process. The quality of and diversity of these interactions were not present in the same manner in the audiographics lessons.
- In the teacher interviews, the majority of teachers stated that they now wanted more video-conference lessons per subject per week as a result of the overall perceived benefits of the video-conference system for the delivery of lessons.
- Most teachers affirmed that the video-conference system had led to improved teacher - student interactions in their classes and had led to improved student learning outcomes.
- The interviews with students revealed that, for the majority of the students, the video-conference system had led to a more personal level of interaction with their teachers and with their fellow students at the other remote school sites.

CONCLUDING COMMENT

Both teachers and students reported that the increased levels of interactivity in their distance education lessons as a result of using the video-conference system make this form of delivery a preferred option. The video-conference system has had a significant and positive effect on student motivation to learn and in student self esteem and confidence.

The learning benefits perceived by teachers and students resulting from the introduction of the video-conference system in the teaching - learning dialogue have led to the consideration of offering more video-conferenced lessons per week per subject.

The nature and quality of student to student interactions within each school site and, very importantly, between school sites has had a positive impact on learning as well as on the development of a whole class identity.

The increased diversity and quality of teacher to student and student to teacher interactions that have developed from using the video-conference system have enhanced student learning and motivation, and commitment to study.

Early in this report, reference to the work of Oliver and Reeves (1994, p 122) on the educational advantages of audiographics as a mode of delivery in rural schools in Western Australia was made. Their most significant finding is encapsulated in this final statement about audiographics (or telematics) as a distance education technology:

'Telematics teaching is a powerful and flexible delivery tool that has the capacity to significantly lessen the disadvantages suffered by rural students in access to specialist education programmes'.

This study shows that the introduction of the video-conference system can not only build on the specialist provision of a diverse and rich senior secondary curriculum provided by audiographics but also has enhanced the quality of the teaching interaction in the curriculum and demonstrated the capacity to reduce further educational, social and cultural disadvantage attendant in isolated rural locations.

REFERENCES

Anderton, M. & Nicholson, A. (1995) NEW TECHNOLOGY AND CURRICULUM DESIGN. A RESEARCH PROJECT WITH NESB DISTANCE LEARNING STUDENTS. Sydney: National Centre for English Language Teaching and Research.

Ankrah-Dove, L. (1982) The deployment and training of teachers for remote rural schools in less-developed countries. INTERNATIONAL REVIEW OF EDUCATION, 28(1), 3-27.

Arms, J. (1998a) REVIEW OF DISTANCE EDUCATION. BACKGROUND PAPER NO. 4. Melbourne: Victorian department of education.

Arms, J. (1998b) Telematics and video-conferencing for teaching and learning. (unpublished paper). Melbourne: Victorian department of education.

Barker, B.O. (1990) Distance education in rural schools: Advantages and disadvantages. RURAL EDUCATOR, 12(1), 4-7.

Boylan, C. (1992) Teaching and learning using telematics. In C. Boylan (Ed.) RURAL EDUCATION IN PURSUIT OF EXCELLENCE. Proceedings of 8th National Conference SPERA Inc. Armidale.

Boylan, C. and Hemmings, B. (1992) LONG DISTANCE TEACHING: STUDENTS, TECHNOLOGY AND TEACHERS WORKING AS ONE. Wagga Wagga: Charles Sturt University.

Boylan, C., Squires, D. and Smith, A. (1994) Audiographic teleteaching in pre-service teacher education. EDUCATION IN RURAL AUSTRALIA. 4(2), 23-28.

Chadwick, V. (1994) RURAL EDUCATION AND TRAINING PLAN 1994-1997. Sydney: New South Wales Ministry of Education and Youth Affairs.

Distance and Rural Education Directorate (DARE) (1997a) TEACHING IN ACCESS. Bathurst: New South Wales Department of School Education.

Distance and Rural Education Directorate (DARE) (1997b) ACCESS PROGRAM MANAGEMENT MANUAL. Bathurst: New South Wales Department of School Education.

D'Cruz, J. V. (1990) TECHNOLOGY IN EDUCATION. A STUDY OF POLICY AND PRACTICE IN RURAL SCHOOLS. Victoria: Ministry of Education.

Farrell, K. (1997) Report on the Beaver County (Okalahoma) interactive video teaching program. EDUCATION IN RURAL AUSTRALIA, 7(1), 37-39.

Forster, M. F. (1993) Preparing teachers and supervisors for the expanded potential of 'distance' education. In D. Riley (ed.) TOWARDS 2000: SCHOOLING THROUGH DISTANCE EDUCATION. Proceedings of the first national distance education conference. Cairns: SPERA, pp. 219-231.

Hemmings, B. and Boylan, C. (1992) Lessons for the future: A remote rural practice teaching program. EDUCATION IN RURAL AUSTRALIA, 2(2), 25-32.

Metherell, T. (1989) RURAL SCHOOLS PLAN. Sydney: New South Wales Ministry of Education and Youth Affairs.

Oliver, R. & Reeves, T. (1994) TELEMATICS IN RURAL EDUCATION. AN INVESTIGATION OF THE USE OF TELEMATICS FOR THE DELIVERY OF SPECIALIST PROGRAMMES FOR STUDENTS IN RURAL SCHOOLS. Mt. Lawley, WA: InTech Innovations, Edith Cowan University.

Oliver, R. and McLoughlin, C. (1997) Interactions in audiographics teaching and learning environments. AMERICAN JOURNAL OF DISTANCE EDUCATION, 11(1) 34-54.

Sandery, P. & Lundin, R. (1993) Teachers' professional development through open learning: Pitfalls and challenges. In D. Riley (ed.) TOWARDS 2000: SCHOOLING THROUGH DISTANCE EDUCATION. Proceedings of the first national distance education conference. Cairns: SPERA, pp. 453-462.

Squires, D. and Sinclair, R. (1993) "I can be near my horses". REPORT ON THE TELEMATICS ACCESS PROJECT IN NEW SOUTH WALES. Sydney: New South Wales Department of School Education.

Tuovinen, J. E. and Boylan, C. (1993) TELEMATICS EDUCATIONAL ENHANCEMENT PROJECT: A REPORT. Wagga Wagga: Charles Sturt University.

Tuovinen, J. E. and Boylan, C. (1994) TELEMATICS IN PRESERVICE TEACHER EDUCATION. Paper presented at APITITE'94 Conference, Brisbane.

Walker, R. and Boylan, C. (1992) Technology and distance education. EDUCATION IN RURAL AUSTRALIA, 2(1), 63-66.

Wilson A.T. (1996) Distance Learning: Technologies, Curriculum Development and Teacher education. ERIC document ED400807.

Wright, N. (1991) SENIOR SECONDARY EDUCATION VIA TELEMATICS. Paper presented at the 1991 NSW CEG Conference.

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