

The quality of teaching and learning via videoconferencing

Damian Knipe and Maria Lee

Damian Knipe is a research fellow based in St Mary's University College Belfast working on a variety of research projects, which include school leadership and self-evaluation in schools. Maria Lee is a lecturer in the Centre for Computer Based Learning at QUB with a keen interest in computer mediated communication. Address for correspondence: Damian Knipe, St Mary's University College, 191 Falls Road, Belfast BT12 6FE, Northern Ireland. Tel: 02890 327678; fax: 02890 333719; email: d.knipe@stmarys-belfast.ac.uk

Abstract

Now that videoconferencing is being widely used for the delivery of mass lectures between sites, there is concern that the quality of teaching and learning experienced, using this method of delivery, is not as good as that experienced in a traditional classroom situation. The study aimed to investigate this concern by using a research diary to collect information on classroom activities and cognitive outcomes which students at local and remote sites experienced over a ten-week period. The results indicated that remote site students did not experience the same quality of teaching and learning as local site students.

Introduction

Over the years there have been significant changes in policies, organisation, staffing and funding of universities. One consequence of these changes is that students who now attend university are no longer drawn from an elite or privileged group but become more representative of the general population. Because of this increase in demand, it has been necessary to introduce and foster innovative approaches and structures and to make the most effective use of new technology in higher education. Morgan examined a report by the Joint Funding Councils' Libraries Review Group, and states that it: "Identifies long-term changes in the make-up of the student population, with more part-time and mature students; modularization of courses; changes in teaching and learning methods; and a greater stress on student-centred learning..." (Morgan, 1996, 359). With the transformation of higher education into a system that has to cope with much larger numbers comes the need to develop a greater flexibility to suit student needs. Distance learning methods free students from the constraints of time and place and allow for more personal feedback than could be achieved from the traditional university teaching system. New tools in higher education can help meet the ever-increasing demands of

accommodating the increasing student population. One tool that can help in meeting this demand is videoconferencing.

Videoconferencing

The term videoconferencing is defined by Laurillard as a: "One-to-many medium, making it a sensible way to provide access for many sites to a remote academic expert." (Laurillard, 1993, 166). It is synchronous, ie, the system is used at the same time by both lecturer and students, and provides a solution to particular educational needs and logistical problems. Cochrane states that: "The motives for using videoconferencing are varied and include providing access to learners in remote areas, ensuring that students are exposed to a technology which is increasingly used in professional practice, and easing course delivery problems when separate institutions merge" (Cochrane, 1996, 318). Freeman (1998) felt that one benefit of using videoconferencing was that it provided a potential solution for reducing duplication in teaching. With staff halving their hours of teaching they would produce better teaching materials by having more time to do so. From his study he claims that the main benefit from using videoconferencing was that students obtained equal treatment and access to experts and information.

There are disagreements as to what videoconferencing should be used for. Mason felt that the main method of teaching used in higher education, ie, the lecture, does not lend itself well to videoconferencing. She states: "Lecturing is a perfectly valid, perhaps indispensable, method of conveying, explaining and reinforcing information, but two-way videoconferencing is not necessarily the appropriate medium for it" (Mason, 1998, 82). She also argues: "... small group tutorials should be the model for two-way video" (Mason, 1998, 81). Whereas Laurillard felt that: "Video-conferencing invites the delivery of lectures... it is definitely a presentational medium as well as being a discursive one." (Laurillard, 1993, 167).

Even though Freeman (1998) found benefits to the use of videoconferencing, his main criticism was that both students and staff felt the lecturing, learning activities and interactions were not improved via videoconferencing. They were actually slower and time was lost through technical difficulties and the greater likelihood for distractions at the remote site.

Teaching and learning via videoconferencing

Recent studies on videoconferencing seem to concentrate more on the practical advantages that the medium has, rather than focusing on the quality of teaching and learning. Bollom *et al* (1989) found that the potential for interaction and discussion with students rarely takes place. Their study found students to be reluctant in making use of the videoconferencing facility to discuss issues and raise questions. Instead, the best use of the facility was in the form of a didactic lecture.

Dallat *et al* who questioned both lecturers and students before and after they had used videoconferencing for teaching and learning found a saving in travel time and cost as an anticipated advantage. They also found that the university would enhance its public

image due to this new approach to providing education. However, they went on to say that: "None of the tutors however believed videoconferencing had the potential to provide students with an entirely effective learning experience" (Dallat *et al*, 1992, 17). Referring to style of teaching in a videoconferenced course Dallat *et al* (1992) found that some tutors dominated more than usual and thus students were not given the opportunities to interact with other students or the tutor. They felt that the lecturer became more challenged using videoconferencing than the students. In conclusion, Dallat *et al* (1992) felt that because the traditional model of face-to-face classroom delivery is the yardstick which both lecturers and students use to identify quality teaching and learning, then by using this yardstick videoconferencing comes second best. This is especially so when its use is in a class where a high level of interaction is essential.

Freeman (1998) reports on a videoconferencing trial between two Sydney metropolitan campuses, concentrating on Business Finance mass lectures (330 students) which was a compulsory subject of the undergraduate business degree. The main method of teaching used during the videoconferencing was the lecture and no attempt was made at using it for tutorials or student consultations. Freeman's 1998 study looked at problems staff encountered with videoconferencing. They include a greater need to prepare materials and effective planning for their use, a greater reliance on other people to make a lecture work, a restriction on lecturing style, additional distractions to the learning environment and a massive increase in stress caused by all the above. Even though the problems existed Freeman reported was that there were no changes in students' final results.

Methodology

Sample

The sample chosen for this piece of research included students enrolled on a Masters degree course in Computer Based Learning at a UK university that was delivered to both local and remote site students using videoconferencing. In total 66 students were studying for the Masters degree and they were made up of 45 local site students and 21 remote site students.

Method of data collection

The instrument used for the purpose of this study was a research diary. At this point, it is important to clarify what a research diary is and why it is an appropriate instrument for this particular piece of research. Corti states: "Diaries are used as research instruments to collect detailed information about behaviour, events and other aspects of individuals' daily lives" (Corti, 1993, 1). Self-completion diaries, as used in this research, have according to Corti three main advantages over other forms of data collection. She writes: "Diaries can provide a reliable alternative to the traditional interview method for events that are difficult to recall accurately or that are easily forgotten. Like other self-completion methods, diaries can help to overcome the problems associated with collecting sensitive information by personal interview. Diaries can be used to supplement interview data to provide a rich source of information on respondents' behaviour and experiences on a daily basis" (Corti, 1993, 1).

The diary used for the purpose of this research is derived from McEwen *et al's* (1996) CRAGS (Cognitive Research into A-levels and GNVQs) research project. Their particular diary adopted a general strategy to enable teachers and students to provide information about teaching and learning as close as possible to "real" classroom practice, while at the same time allowing the participants an opportunity to reflect upon and interpret their own experiences. A self-observation schedule (research diary) which was relatively easy to use in terms of clarity, time and effort was designed for the purpose of their study. By making slight changes to the aforementioned CRAGS diary, in the explanations of the categories used, this research instrument was deemed suitable for the purpose of evaluating the quality of teaching and learning in local and remote site classrooms.

Procedures followed

Participants were asked to keep a diary for a period of ten weeks during which time they were to record details of their classes along the categories outlined in a diary page. The diaries were completely confidential and could only be identified by a personal identification number (PIN). A typical week started by asking participants to explain what their intentions and expectations for the week were and what they expected to learn. On the diary pages the categories were presented in an abbreviated form, however, the categories were fully explained after each abbreviation. Participants were to indicate YES or NO as to whether a classroom activity or cognitive outcome took place during the class. The classroom activity categories included: receive information; receive an explanation; receive instructions; receive guidance; note-taking; working with notes; reading; questions/answers; group discussion; exercises; planning; working with I.T.; working with equipment; working with materials; making presentations; preparing for project; revision; and other. The cognitive outcome categories included: developing terminology; ordering and memorising; understanding; alternative viewpoints; consolidation; producing new ideas; critical evaluation; constructing own explanations; problem-solving; mastering skills—specific; decision-making; applying theory to practice; aesthetics; values; and other. At the end of each week, students completed the third section of the diary, learning to learn. They were asked to rate on a scale of 0 (not at all) to 2 (to a large extent), the extent to which each item took place during a week. The items included: sources of information; planning and self-monitoring; independent learning; feedback; confidence; working as a team; and communication.

Results

There were a total of 66 students enrolled for the Masters degree course and the research generated diaries from 29 local site students (64%) and diaries from 17 remote site students (81%).

Pedagogy (local students vs remote students)

Figure 1 compares the viewpoints of local students and remote students over the ten-week period. The most interesting point about this comparison is the high level of disagreement between the perceptions of local students and remote students on the

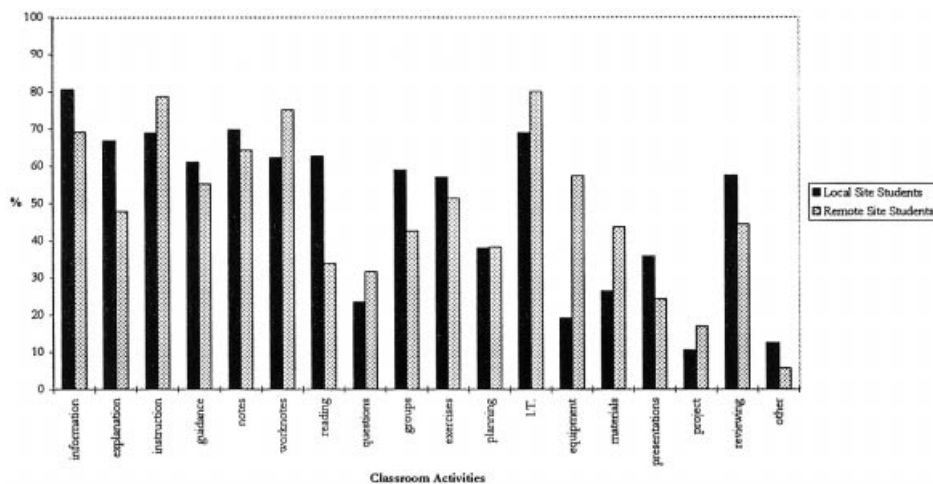


Figure 1: Percentage of classes during which the following types of classroom activities took place

teaching methods and classroom activities that occurred during the classes. Local students reported a higher occurrence of activity in ten of the eighteen items. Therefore, indicating half of the classroom activities occurred more with the remote students and the other half occurred more with the local students. The differences between the two sets of students on the specific classroom activities were more than 10% in eleven of the eighteen items. Local students tended to report more on receiving information and explanations from the lecturer, reading and reviewing material, working within groups and making presentations to their colleagues. Whereas, the remote students reported more on receiving instructions and work-notes from the lecturer and working with information technology, equipment and materials during the course of a videoconferencing session. The remaining items of guidance, note-taking, questions, exercises, planning, project work and other activities were reported as occurring to the same extent by both sets of students.

The biggest difference between local students' and remote students' ratings was with regard to working with equipment which the remote students reported as taking place in 57% of classes over the ten-week period, compared to the local students who reported it occurring in only 19% of classes. Another striking difference between the two sets of students occurred in reading material during class. Local students reported this as happening in 63% of the classes compared to the remote students who reported it in 34% of classes.

Cognitive outcomes (local students vs remote students)

Figure 2 compares the level and range of cognitive outcomes experienced by both local and remote students over ten weeks of classes. Again, just like with the classroom

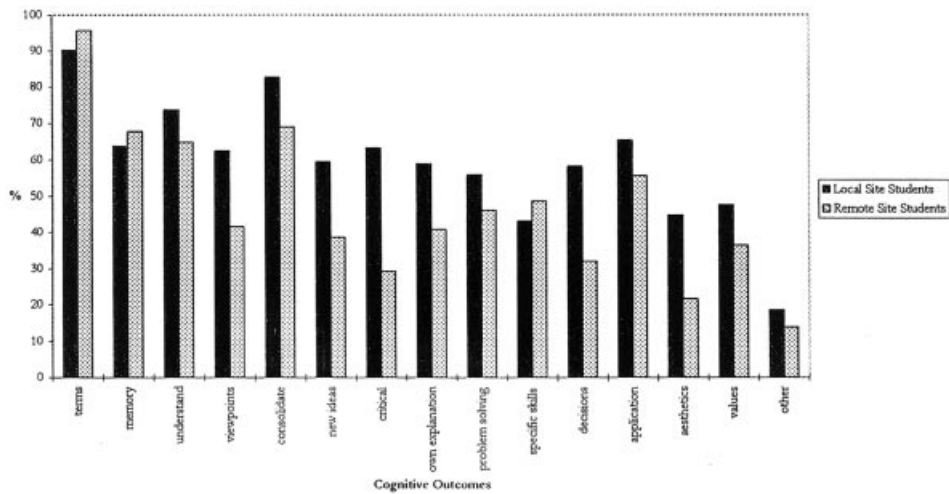


Figure 2: Percentage of classes during which the following types of cognitive outcomes took place

activities, there is a high level of disagreement between the two sets of students. This is possibly due to the categories being more open to interpretation compared to the more directly observable categories of classroom activities. It is clear that local students experienced a higher occurrence of cognitive outcomes than their remote counterparts. There were only three of the fifteen categories in which the remote site students reported a higher occurrence of learning. These categories included learning new terminology, memorising information and practising specific skills, however, it must be noted that the differences for these three categories were very small, ie, <5%. In relation to the specific cognitive outcomes, differences of 10% or more between local students and remote students occurred in ten of the fifteen categories and for each of these ten categories, local students reported a higher occurrence. The categories included learning about alternative viewpoints, consolidating previous learning, generating new ideas, learning to be critical, learning to construct own explanations, problem-solving, learning about decision-making, applying theory to practice, developing personalised aesthetics and identifying values.

The most obvious difference between local students' and remote students' ratings was for the category learning to be critical, which the local students reported as taking place in 63% of classes over the ten weeks. The remote students reported it in only 29% of classes. Another interesting point to consider was the high occurrence for both sets of students of learning new terminology and technical vocabulary during the ten weeks of classes for term one in 1998. All the students in over 90% of classes reported it.

Learning to learn (local students vs remote students)

Figure 3 shows the difference between local students' and remote students' ratings on the learning to learn index that was completed at the end of each week for a total of ten

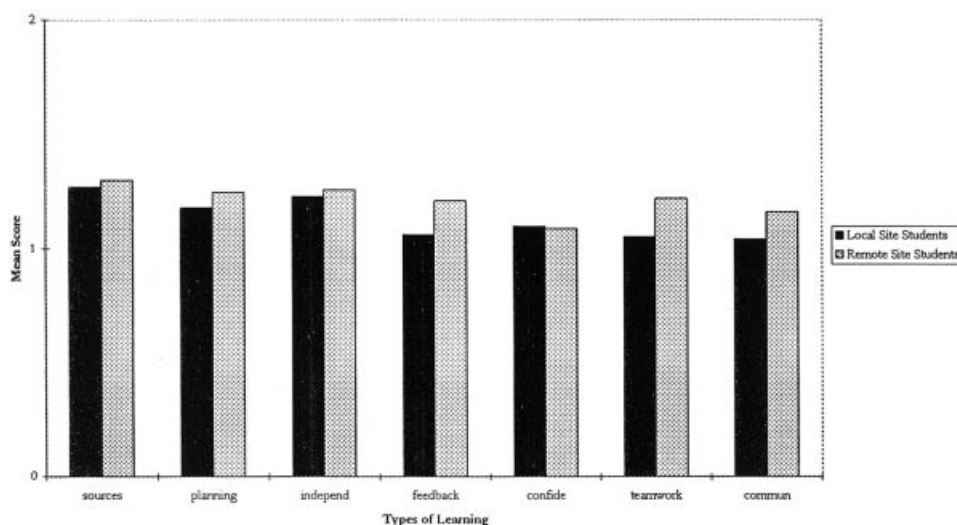


Figure 3: Mean score showing the extent to which the following types of learning took place

weeks. There was good agreement between remote site and locally based students about the relative degree to which the seven descriptors of learning were rated as high or low. Two differences were evident, remote students felt they were better able to work as members within a group compared to the local students and they were able to receive and use feedback more extensively than the local students were.

Quality of teaching and learning: classification of students

By combining the first two indices covering classroom activities (Figure 1) and cognitive outcomes (Figure 2), some cautious assessment can be given of the quality of teaching and learning between remote site and locally based students. Figure 4 shows the number of classroom activities on the Y-axis and the number of cognitive outcomes on the X-axis. The mean scores for the two indices determined the four quadrants. To be included, students had to report each item in 30% or more of the classes over the ten weeks.

In total 46 students, 29 from the local site and 17 from the remote sites returned research diaries. The high:high quadrant contains those student diaries that reported a relatively high number of both classroom activities and cognitive outcomes. Overall, almost one third of the student diaries fall into this quadrant regardless of where they were based. When it is broken down by site 41% of the local students' diaries and 18% of the remote students' diaries occupy this quadrant. The low:low quadrant contains those student diaries that reported a relatively low number of classroom activities and cognitive outcomes. Overall, just over one third of the students' diaries fall into this quadrant regardless of where they were based. When it is broken down by site, 65% of the remote students' diaries and 28% of the local students' diaries make up this

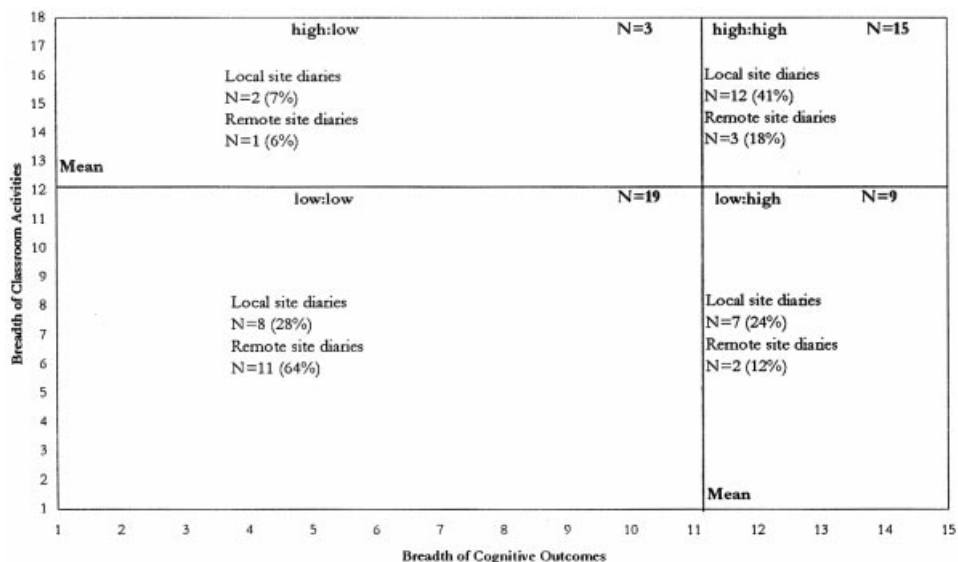


Figure 4: Students' diaries: the "quality" of teaching and learning

quadrant. In the high:low quadrant (high in classroom activities and low in cognitive outcomes) there are only one remote and two local students' diaries. The low:high (low in classroom activities and high in cognitive outcomes) quadrant contains seven local and two remote students' diaries.

Displaying the data in this combined way shows that local students appear to have the edge over remote students in terms of variety of teaching methods used and cognitive challenge as indexed by range of learning outcomes being pursued in classes.

Discussions and conclusions

The findings from the research diaries on classroom activities indicated that the local students were receiving more information and explanations from the lecturers, were reading and reviewing material more and were working in groups and making presentations more than the remote students. The question to be asked is what possible reasons could contribute to these particular classroom activities being more apparent at the local site? One reason why local students reported receiving more information and explanations from the lecturers could be due to the physical presence of the lecturers. The local students would have had better opportunities to talk to the lecturers during the break between lecture and practical exercise and during the practical exercise itself. In relation to reading and reviewing materials, perhaps the students at the local site read and reviewed more during the lectures and practical exercises because they did not receive reading material from the lecturers until the lecture began or in some cases until the practical exercises began. Whereas those students at the

remote sites had received the reading material as soon as they arrived at the campus because it had been posted to the administrative staff who distributed it to the students before the class began. Group work and making presentations were two other activities that the local students reported as being more prominent during the classes compared to remote students. This may be explained by the fact that working within groups is quite difficult to organise at a distance. The groups at the remote sites were not supervised to the same extent as at the local site due to the fact that no one was there to instruct and observe the students. Perhaps the group work and presentations were not carried out as often. Abbott *et al* found that a student in their study: "Believed that videoconferencing might afford the less active participant the opportunity to hang back in group and cross-campus talk" (Abbott *et al*, 1994, 90). This is an indication that group work at a distance may be beyond the lecturer's control and therefore not as prominent an activity.

Students at the remote sites, on the other hand, reported receiving more instruction and using worknotes from the lecturers compared to those at the local site. It seems likely that this is due to the students at the remote site receiving instructions on how to operate the videoconferencing equipment when technical problems arise or how to check that software is installed on PCs. Regarding worknotes, students at the remote sites relied heavily on the PowerPoint slides handout. This was due to times when the remote site students did not easily see the monitor on which the slides were projected, whereas those at the local site could view the large screen at the top of the room. Remote site students also reported that they worked with I.T., equipment and materials more than their colleagues at the locally based site. It would appear that this is due to the remote students having to operate the microphone, camera, speakers, monitors, PC, diskettes, etc during the course of the videoconferenced class, whereas the local students did not.

When asked about the cognitive outcomes during the course of the classes, local students reported a higher occurrence of learning in ten of the fifteen categories. This indicates a more extensive breadth of learning by the local students during the classes. There are many reasons why this could be so. First, the students at the local site are in an environment where better co-operative learning can take place. There are a greater number of students based there compared to the small number at the remote sites. Beachler and Glycer-Culver found that a co-operative learning environment is one that: "Creates positive relationships among students as they work through the group learning process" (Beachler and Glycer-Culver, 1998, 7). The fact that there are smaller numbers in the remote sites means that groups consist of the same members all the time therefore relationships are restricted, whereas, the local students have the opportunity to work in different groups more regularly therefore creating more positive relationships. The fact that local students have a better chance of mixing in different groups during classes means that they have more opportunities to learn about alternative viewpoints and explore or generate new ideas. They have a better opportunity to learn to be critical of themselves and others, learn to construct their own explanations, solve problems, make decisions, develop personalised aesthetics and identify values.

Second, the students in the remote sites do sometimes feel isolated and not part of the class especially when eye contact is not made with them and questions are not repeated to them. This can have an adverse effect on their learning during the course of a class. Because they do not feel part of the class, they can lose concentration and interest in the subject matter and tend to put more effort into independent learning. This type of learning does not accomplish the same goals and benefits as co-operative learning, which Beachler and Glycer-Culver suggests helps: "Students develop group process and team work skills, important skills for them to obtain to function effectively in the world of work. Students develop interpersonal social skills in order to function effectively in small groups. Students promote each other's learning by helping, sharing and encouraging efforts to learn, thus better conceptual understanding of complex information is gained. Students reinforce their own learning through the process of explaining and sharing their work with others in the group" (Beachler and Glycer-Culver, 1998, 7).

Third, the students in the remote sites could have experienced, what Freeman (1998) found, a reduction in learning time which may go some way to explain the results of the learning outcomes. Valuable time may have been wasted by remote site students having to set up and operate the videoconferencing system or checking that NetMeeting was installed on the PC onto which the PowerPoint slides were going to be shared from the local site. During this time, the local students could have accomplished more learning. Freeman (1998) also found that a videoconferenced class had an increased potential for disruptive behaviour as reported by the students in his sample. This could be a fourth reason for remote site students reporting a lower frequency of cognitive outcomes during their classes. Because students had the opportunity to sit out of the view of the camera, the lecturer had no way of knowing what they were doing. Students could have walked out of the room, used a PC, or chatted to other students and the lecturer would have had no control over these things. This ultimately has an effect on the rest of the students and could contribute to this lower frequency of learning outcomes in the class. Freeman states in his study that: "Students reported that these disruptions could dramatically affect their concentration and learning" (Freeman, 1998, 204).

If videoconferencing is to be used efficiently and effectively then a good working relationship needs to be established and maintained between the organisers at the local and remote sites. The students rely heavily on them to ensure that the videoconferencing equipment is operating properly, is set up correctly, is positioned effectively and that the room provides an environment which is comfortable, well arranged and ready to be used without having to move furniture.

It seems from the findings reported here that the quality of teaching and learning is not the same in a course delivered via videoconferencing as it is via the traditional classroom based situation. However, it must be said that this is not entirely due to videoconferencing as a medium and that other factors contribute to it. As remote site students, they are being taught through a monitor, camera and microphone and this in itself is difficult to cope with. It must also be remembered that inexperience, bad

preparation and planning, unsuitable teaching strategies and inefficient training on the part of the facilitator also have a bearing on the quality of teaching and learning in a videoconferenced class. As Cochrane found in his research: "It is naive to assume that merely linking distant groups or individuals at different locations creates an effective learning environment" (Cochrane, 1996, 320).

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