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VET goes virtual: Can web conferencing be an effective component of teaching and learning in the vocational education and training sector?

SUSAN TODHUNTER

TONI-MAREE PETTIGREW*

DEPARTMENT OF EDUCATION, TRAINING AND THE ARTS, QUEENSLAND

*NCVER NEW RESEARCHER AWARD RECIPIENT

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Level 11, 33 King William Street, Adelaide SA 5000
PO Box 8288 Station Arcade, Adelaide SA 5000, Australia

ph +61 8 8230 8400 fax +61 8 8212 3436
email ncver@ncver.edu.au
<http://www.ncver.edu.au>
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About the research

VET goes virtual: Can web conferencing be an effective component of teaching and learning in the vocational education and training sector? by Susan Todhunter and Toni-Maree Pettigrew

One of the research objectives of the National Centre for Vocational Education Research (NCVER) is to build the research capacity of the vocational education and training (VET) sector. To this end, NCVER made a number of new researcher awards to support the attendance of new researchers at NCVER's 2007 'No Frills' conference. One of these awards went to Toni-Maree Pettigrew, and this paper, of which she is a co-author, is based on her presentation at the conference.

New technology has revolutionised the delivery of distance education in recent years, as well as changed the educational experience of on-campus students. However, the educational benefits of personal interaction remain undiminished, and now the challenge is to harness technology to promote that interaction. One such technology is web conferencing, the subject of this paper. It chronicles the perceptions, expectations and practical experiences of 12 VET teachers and approximately 40 students across a range of vocational training areas in the use of web conferencing for learning and teaching.

Key messages

- The motivation for web conferencing is to reduce costs (especially travel) and to enrich the educational experience of students.
- The experience was generally viewed very positively. Collaboration and interactivity enabled a greater sense of connection to the learning experience for both students and teachers. The technology promoted flexible options for group learning and provided an ability to return to recorded sessions at a later date.
- Students are unforgiving of technical glitches and they require appropriate broadband and technical equipment such as headsets.
- Opportunities for business development with industry were also apparent.

Tom Karmel
Managing Director, NCVER

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Introduction and background

This paper provides an overview of a research project exploring the effectiveness of web conferencing in the Queensland vocational education and training (VET) sector. Students and teachers engaged in web conferencing as part of their studies at the Southern Queensland Institute of TAFE during term 3 in 2007. The research investigated the perceptions, expectations and experiences of the participants.

Better use of educational technologies for teaching and learning in the VET sector is critical if the objectives of the Queensland Skills Plan (Department of Employment and Training 2006) are to be achieved and the increasing demand for flexible and contemporary training is to be met (Todhunter 2007). The Queensland Skills Plan outlines a state policy framework designed to match the supply of skilled labour to industry's needs and the economy's demands. The challenge to incorporate the latest technologies into current teaching and learning practices 'relies on teachers, trainers and assessors being familiar with the latest technology and combining this with current teaching and learning techniques' (Department of Employment and Training 2006, p.15). The research project originated from the Communications Architecture Program, an element of TAFE Queensland's Information Technology Services' Program of Works 2006–10. This program encompasses the communications infrastructure required for mobile communications, audio, video, web conferencing, instant messaging, video conferencing, 3G, wireless, convergence and voice-over IP telephony. Given the considerable emphasis being placed on e-learning and the move to provide TAFE Queensland with the Learning Management System and Learning Content Management System, it was timely to conduct some exploratory research into the potential use of web conferencing.

Theoretical framework for the project

Neumann and Carrington (2007, p.1) describe 'synchronous audiographic' web conferencing as a technology which now enables the creation of 'effective real-time e-learning'. This technology typically includes the capacity to see and hear participants and enables application sharing and collaborative functionality via shared whiteboards and text chat facilities. Social presence and responses are facilitated by a variety of emoticons and voting features, providing a mix of communication and participant management modes. Other functions include live video, file transfer and 'breakout rooms', which are used for small group interaction.

Little research exists on the use of web conferencing for learning and teaching in either the higher education or VET sectors (Erben 1999; Schullo et al. 2005). There is however substantial research that supports the notion of conversation or dialogue and collaborative learning communities as being powerful learning contexts (Laurillard 1993; Salmon 2000; Salmon 2004).

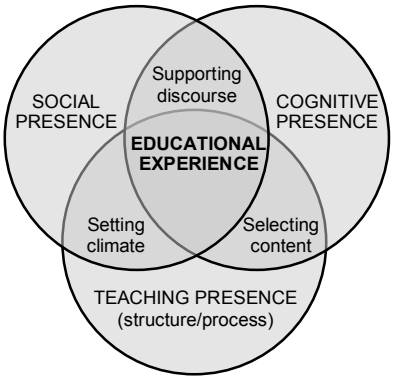
Laurillard's (1993) Conversational Framework describes a teaching–learning process that is iterative and which is applicable to any learning situation, range of subject areas and topics, although not applicable to learning through experience or to what she terms as everyday learning. Ramsden's (2003, p.160) concept that 'teaching is a sort of conversation' aligns with the inherent pedagogic intent contained in the communication features of web conferencing tools. However, it does not automatically follow that the existence of the communication tools equates to advantages and

benefits of conversational learning. Technology can still be used with an instructivist approach, which may tend to limit conversation and constructive learning, reflecting the concept of theory-in-use as opposed to espoused theory (Argyris & Schön 1974).

The development of participants' sense of community in the electronic medium is vital in order to encourage collaboration and shared understanding (Salmon 2000). Community is particularly pertinent to the use of web conferencing technology since individual group breakout rooms provide participants with the opportunity to work in small groups on collaborative and discussion tasks as well as providing a private conversational space. This highlights the impact of learning from one another (Baltes 2000) and assists in building a 'collective consciousness', which is described as an awareness of seeing things how others might see them (Bowden & Marton 1998, pp.14–15).

Garrison (2007) discusses his Community of Inquiry Framework, illustrated in figure 1, in terms of asynchronous discussion and dialogue, rather than the synchronous modality afforded by web conferencing technology. However, it is clear that, for interaction to play a key role in higher-order learning, learning design and leadership through facilitation and direction are applicable in both instances (Garrison 2007). It is interesting to note that, in Garrison's study (2007, p.63), the 'directed facilitation factor contributed the most to predicting a sense of community and learning', although he contends that from a student perspective it might be considered that they may not distinguish between facilitation and direct instruction.

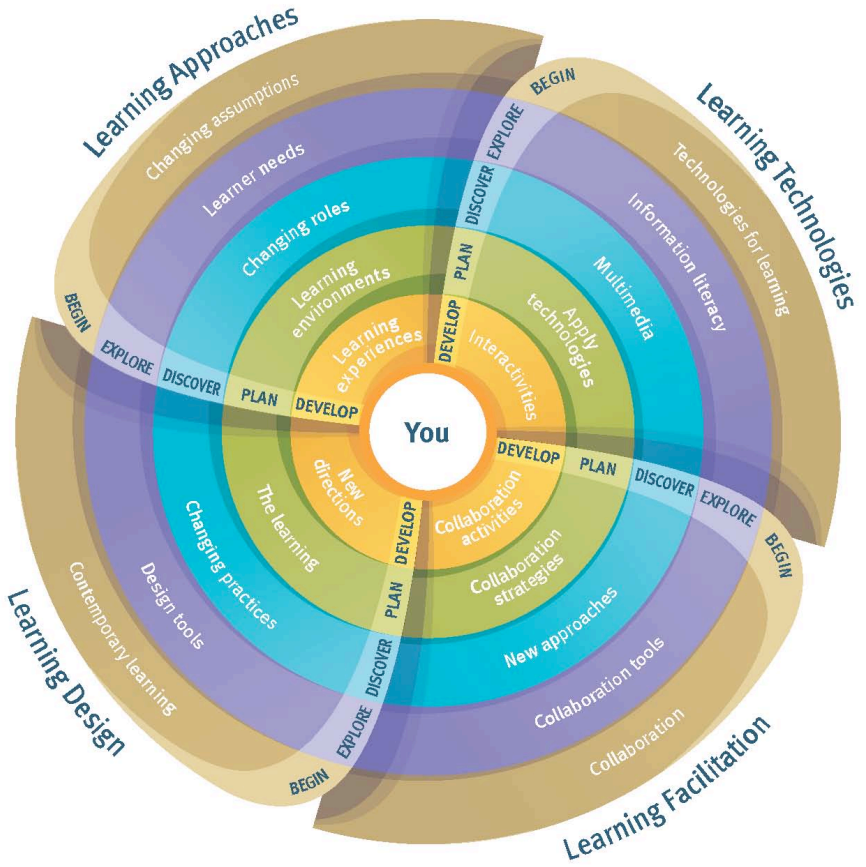
Figure 1 Community of Inquiry Framework



Source: Garrison (2007, p.62).

Facilitation skills and the 'class' preparation required for teachers to facilitate the real time e-learning made possible by using a tool such as web conferencing are different from those that might be used in face-to-face learning and teaching situations. The Technologies for Learning Framework (Todhunter & Pettigrew 2007) in figure 2 describes an approach to the professional development needs of teachers who are new to using technologies for learning and teaching. In order to build capability specifically in the area of learning facilitation, the framework explores collaborative and community learning and the different methods teachers might adopt to engage and interact with their students using web conferencing. This area covers the social construction of knowledge, collaboration tools and planning, and developing collaborative learning activities. As Holmberg highlights, it is the capacity for teachers to support and help students without delay that has proved very effective and 'speed, frequency and empathy together should characterise interaction in distance education' (2005, p.88).

Figure 2 Technologies for learning—a professional development framework



Todhunter and Pettigrew 2007
(Adapted from Schlanger and Howes' Capability Enhancement Strategy 2006)
© Copyright State of Queensland (Department of Education, Training and the Arts)

Source: Todhunter and Pettigrew (2007).

Engaging the contemporary student and providing an optimal learning environment need to be closely related to students' experiences, needs, expectations and perceptions (Howland & Moore 2002; Ginns & Ellis 2007). Howland and Moore's (2002) research found that students who portrayed positive attitudes about their e-learning experiences displayed the attributes of constructivist students who were self-directed. This notion is supported by Ginns and Ellis (2007, p.63), who claim that positive perceptions of the learning environment tend to be correlated with 'deeper approaches to learning, and subsequently more positive learning outcomes'. Those students with negative approaches and perceptions reported a need for more guidance and were less able to understand content and to trust a self-assessment of their learning. Student engagement and active involvement may need to be increased to enhance and achieve successful learning outcomes in the unique real-time e-learning environment. Research by Howland and Moore (2002) suggests that those students who are actively involved in seeking knowledge rather than relying on direct instruction also experience better retention. Along with other variables, student-to-student interactions are associated with the quality of approaches to study and learning outcomes and are also likely to improve students' perceptions and their grades (Entwhistle & Ramsden 1983; Ramsden 1991; Ginns & Ellis 2007).

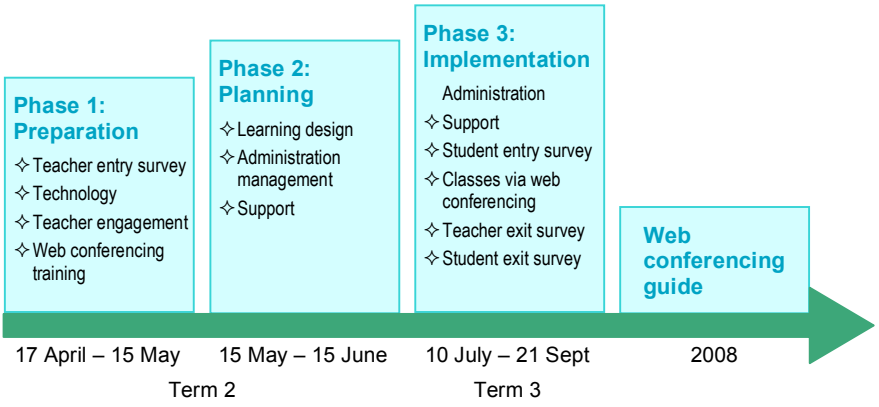
Research design and methodology

The overall research study was guided by the question of 'what are the perceptions of the teachers and students in relation to the potential use of web conferencing technology, the barriers to its use and the implications for teaching and learning?'. This question was investigated by examining the experiences of teachers and students trialling web conferencing technology as part of their studies at the Southern Queensland Institute of TAFE during term 3 in 2007. The Southern Queensland Institute of TAFE is the most geographically dispersed TAFE institute in Queensland and comprises nine campuses servicing an area similar in size to the state of Victoria. With over 300 full-time, part-time and short courses and 20 000 enrolled students, the Southern Queensland Institute of TAFE faces the challenges associated with a dispersed student base. This issue is currently being addressed by the use of a learning management system (iLearn) and video conferencing technology via Videolinq.

As illustrated in figure 3, the research project timeline was divided into three phases:

- Phase 1: Preparation
- Phase 2: Planning
- Phase 3: Implementation.

Figure 3 Research project timeline



Phase 1: Preparation

The preparation phase comprised the development and delivery of the survey instrument, preparation of the technology, teacher engagement and training.

Teacher entry survey

To obtain data on their perceptions and expectations, each teacher was invited to complete a web-based survey prior to any training in the use of the proposed web conferencing package. The survey instrument was designed in conjunction with a project manager from the Southern Queensland Institute of TAFE and comprised 30 questions. Twenty-eight of the questions were phrased to allow responses to be provided on a five-point Likert scale from zero to four and two were open-ended. Participants responded to questions on their past experience with web conferencing, the issues they perceived as barriers to the effective use of web conferencing, the extent to which they saw web conferencing being used for teaching and learning in their environment, and where greatest benefits might flow from its use.

Technology

Organisation of the necessary hardware and software required the collaboration of the research project's major stakeholders. These were the Southern Queensland Institute of TAFE, TAFE Queensland's Information Technology Services and Learning Technologies (the researchers), industry and VET policy—through the Department of Education, Training and the Arts—and Unisys, which is the contract supplier of technology support. All computers to be used during the research project required installation of Java software and the modification of security firewalls. The web conferencing tool Elluminate (<www.elluminate.com>) was used for the trial. Final testing was carried out to ensure the smooth operation of the web conferencing tool, and participants accessing the software from home were requested to test and confirm that their computer facilities were compatible with the web conferencing tool.

Teacher engagement

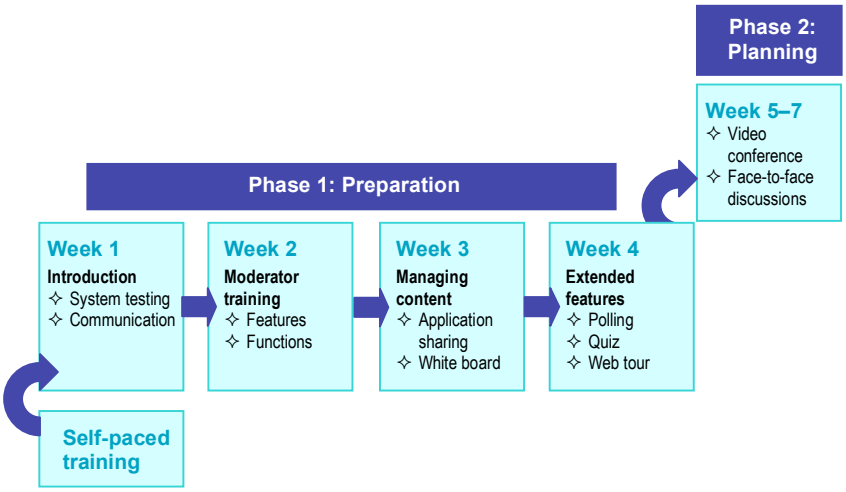
To achieve maximum teacher engagement, a communication strategy was developed and implemented; it defined critical promotional opportunities, communication points, timeframes and a communication medium for each of the phases.

Teacher training

The training program was designed collaboratively by the Elluminate training division, the researchers and the Southern Queensland Institute of TAFE project manager, and occurred on several levels over a number of weeks, as illustrated in figure 4, and included:

- ✧ participants' access to self-paced training via the Elluminate website
- ✧ facilitated training sessions, covering functionality, features and moderator training
- ✧ professional conversations considering the potential pedagogical applications
- ✧ collaboration and discussion on learning design for web conferencing for specific 'vocational training areas' (VTAs).

Figure 4 The training program



Phase 2: Planning

The planning phase included three elements:

- ✧ learning design for web conferencing
- ✧ system administration
- ✧ user support.

Learning design for web conferencing

The research project represented an opportunity to demonstrate good practice in student engagement, with Laurillard's (1993) Conversational Framework and Garrison's (2007) Community of Inquiry Framework forming a discussion basis for the learning design. Todhunter and Pettigrew's (2007) Technologies for Learning Framework provided guidance for the professional development required to facilitate learning via web conferencing. A guest speaker from a private registered training organisation that has successfully adopted web conferencing as the main teaching and learning platform shared examples and experiences via video conference with the teacher participants to initiate transition into the planning phase. Follow-up face-to-face informal discussions were facilitated by the researchers at the Southern Queensland Institute of TAFE's regional campuses. A web conferencing lesson plan tool was developed to assist teachers with their planning, while the Elluminate virtual classroom design template outlined the importance of interactivity and conversation in the virtual environment. Participating teachers subsequently worked individually or collaboratively in preparation for term 3 delivery.

System administration

A Southern Queensland Institute of TAFE Information Systems Officer received training in managing the web conferencing tool's Session Administration System (SAS) administrator functions, which was required to establish each teacher's individual virtual classroom. The research project had access to 25 concurrent seats and, depending on class size, a number of classes could be conducted simultaneously. This required timetabling planning, and a shared booking calendar was implemented in collaboration with all stakeholders, which enabled teachers to view and make bookings without the involvement of a third party.

User support

Provision for student and teacher user support during the implementation phase was defined, a student orientation and guide was developed and a single-support point of contact was made available for students and teachers who needed assistance. The Elluminate training and technical support teams were also on hand to provide assistance where necessary.

Phase 3: Implementation

Phase 3 comprised:

- the establishment of Elluminate's Session Administration System to provide teachers with access to their virtual classrooms
- planning and learning design for classes to be conducted via web conferencing
- support mechanisms
- distribution of the web-based student entry survey
- virtual classes conducted via web conferencing
- distribution of the web-based teacher exit survey
- distribution of the web-based student exit survey
- collection and analysis of data
- preparation of the report and recommendations.

Students were invited to respond to an entry survey before they participated in the web-conferencing and at the end of the trial both teachers and students were invited to respond to an exit survey. A group interview was also held with the participating teachers via video conference to gain their personal views in a less structured manner. Interviews were not possible with the student groups.

Responses to all of the entry and exit surveys questions were statistically analysed to provide a profile of the participants' prior experience with web conferencing and their perceptions of this method of learning. Mean responses to each of the questions were calculated to identify differences in the levels of response and to allow ranking of the responses; the standard deviation for each set of responses was calculated to identify where there was most consistency amongst the participants' responses. Comments obtained from all of the open-ended questions and the teacher group interviews were analysed thematically and the findings interpreted by the authors to determine if there were any inconsistencies between the quantitative responses to the questions and the participants' comments.

Findings—teacher entry survey

The findings of the teacher entry, exit and group interviews are presented in three parts and represented teachers' perceptions of:

- their experience with web conferencing and the possible technical barriers to using web conferencing for learning and teaching
- how they might apply web conferencing to learning and teaching
- the benefits of web conferencing to the teachers, students and the organisation.

Twelve participants completed the entry survey. Although the number of responses from the teacher entry survey was small, it represented the entire population of the project participants at that time.

Experience and technical barriers

The teachers' responses to the survey questions focusing on their experience with web conferencing and possible technical barriers are shown in table 1 of the appendix. Respondents perceived themselves to have a relatively low level of prior experience with the use of web conferencing, and they did not see their low level of technology skills as a barrier to the use of web conferencing. The greatest barriers were perceived to be students' lack of technology skills, a lack of available funding and lack of available time to learn how to use the new technology.

Thematic analysis of the open-ended comments raised concerns about inequities—where some participants might lack access to the appropriate technology. As one respondent wrote, 'many students in "bush" locations may have poor internet connections', and 'student interaction—that may not be possible in such centres as Longreach and Chinchilla', possibly making it difficult to take advantage of the benefits of web conferencing. There were also concerns raised about restrictions on the ongoing usage of the technology within the institute because of the cost, as evidenced by one participant asking 'can it be kept available, without ongoing costs, in those periods I'm not making use of it?' and 'Will the beancounters look at licensing costs and try to force me to use it or lose it?'.

Application of web conferencing to learning and teaching

Structured group activities (formal structured activities arranged and facilitated by the teacher) were seen as the most likely application. Supporting this interpretation, teachers perceived that there would be more teacher–student interaction than student–student (see table 2 in appendix). Teachers saw collaboration (in the development of a new document, concept or image) as a likely application; however, responses also suggested that facilitated synchronous discussions were seen as a less likely application. Teachers saw the use of web conferencing for content delivery (for example, evening discussion) outside normal class hours as more likely than content delivery during normal class hours.

Benefits of web conferencing

The respondents' perceived benefits of participation in the web conferencing research project to themselves, the students and the organisation are shown in table 3 (appendix). It was interesting to note that the teachers saw the greatest benefit from web conferencing for the organisation, which was slightly ahead of benefits for the teachers themselves and the students.

Thematic analysis of the comments highlighted that there were significant benefits to be achieved associated with:

- reduced travel times, costs and risks normally associated with distance education ('Ability to run tutorials for distance ed students')
- better understanding, skill levels and confidence on the part of teachers and students in the use and application of technology
- greater choice and options for teachers and students for teaching and learning ('The ability to use this technology effectively and efficiently so that it improves my teaching and helps my students and improves the overall technology levels of our institute')
- overcoming many of the problems in teaching and learning associated with distance education ('Another alternative to delivering to students who are separated by distance or who choose to study externally or online'; 'Our institute is so widespread the possibilities for use are very good')
- significantly increased levels of interaction, communication and collaboration between and amongst students and teachers ('Another vehicle for presenting a "classroom" discussion and information development forum')
- creation of a 'richer' learning environment ('Better access to a richer learning environment. Learning experiences can follow them wherever they are')
- flexibility in the way that web conferencing can be used, and the ability to allow students to behave and learn in a way that is similar to face-to-face environments and which is most comfortable for them ('More interaction with their teacher. Better knowledge of new technology and hands on experience and understanding').

Findings–teacher exit survey and interviews

Twelve teachers had initially shown interest in the research project and completed the entry survey; however, for various reasons only six were able to use the web conferencing tool for classes in the third term of 2007. There were five respondents to the exit surveys, with six teachers taking part in the group interview. The group interview provided rich, detailed anecdotal evidence and described a range of outcomes and points of interest, which also assisted in informing recommendations. The same thematic analysis was used for the exit survey comments and group interview and the analysis of the data was confirmed with interviewees, thereby validating its trustworthiness. The researchers however acknowledge that this sample was small.

Experience and technical barriers

There was significant agreement between the teachers regarding their high participation levels in the web conferencing trial, and it is interesting to note that they also considered that their current web conferencing skills were now high, in contrast to the perceived low levels in the entry survey (table 4, appendix). Technical barriers were also considered to be quite extensive, although there was only moderate agreement between the teachers on this point.

Anecdotal evidence included the following comments.

- 'The technology was easy to use.'
- 'The technology had great appeal to students.'

- ✧ 'The use of breakout rooms the first time was confusing for students but the second time around was more successful.'
- ✧ 'Some unexplained technology issues caused disruption to some classes and an email had to be sent to postpone one class.'
- ✧ 'Students could be very unforgiving when technical issues arose.'
- ✧ 'The training that was undertaken was very professional.'

And, as one participant commented: 'I totally enjoyed it; it was a fabulous experience.'

Application of web conferencing to learning and teaching

Responses in this area for the trial showed that there was little use of quizzes and tests and little development of new documents (see table 5, appendix), although the anecdotal evidence did illustrate some interesting use of the technology. There was a high level of agreement that there was little student initiation of self-directed activities and that most of the activities were those structured and facilitated by the teacher. This corresponds to the perceived use of the tool in the entry survey. There were high levels of interaction between the teachers and the students, with agreement between the teachers on this point. Significant teacher agreement on the high level of communication and interaction substantiates the emphasis placed by Laurillard (1993), Ramsden (2003), Salmon (2004) and Holberg on the importance and criticality of dialogue, community and interaction to learning and teaching.

Additional benefits and comments included the following.

- ✧ 'It was great to be able to talk to the students.'
- ✧ Web conferencing was used in a variety of ways to suit the learning needs and contexts.
- ✧ Diagnostic data for problem-solving was shared.
- ✧ 'Videos were viewed online to generate some very lively discussion.'
- ✧ Applications such as Excel and Access Database were shared to allow students to demonstrate their understanding and talk about what they had learnt.
- ✧ Virtual tours to websites were used to seek information, investigate issues and generate class discussion.
- ✧ An online protractor was used, triangles drawn, measurements taken and online calculations shared: 'We could do all that online and talk about it.'

Benefits of web conferencing

The levels of benefits that teachers saw from the use of web conferencing to themselves, the students and the organisation accorded with information collected from the entry surveys (table 6, appendix). Teachers also commented on the different skills needed by web conferencing moderators, confirming the need for professional development to address the different approaches to learning facilitation (Todhunter & Pettigrew 2007). They outlined some of the advantages of the software, which included the capacity to supplement the functional components of a learning management system and the capacity for students to review recorded sessions to support their learning. From an organisational perspective the generation of new enrolments, business development opportunities and industry and employer interest were noted. Teacher interest in continuing to use web conferencing was high, especially in relation to its potential use with disengaged students.

Comments included:

- ✧ 'It was an eye opener about how much teaching/learning can be done by this means, and also how skilled a moderator needs to be to make it flow smoothly and look easy.'

- ‘A far better understanding of the material. Far higher retention rate.’
- ‘Re-engagement of a consistently disengaged student. The student became involved in the learning and is now ahead of everyone else in assignment and assessment submissions.’
- Can be student-driven: ‘I was late for the first session and all of the students were in the session. The whiteboard was covered and they were using chat to message each other.’
- Enabled students to manage personal responsibilities with learning: ‘Students could be anywhere but were still able to organise themselves to get to a computer and be online to participate.’
- Students expressed that they felt connected—more so than previously.

Findings—student entry and exit surveys

Five students responded to the student surveys. The consistent and predominant message that came out of the student entry and exit surveys was the emphasis placed on interaction, supporting the views expressed in the literature of the importance of social presence and communication in learning contexts (see tables 7 and 8 in the appendix). There was a high level of agreement among students that the tool had helped them to communicate with their teachers and feel part of the class. It was interesting to note that in the entry survey the students had responded that use of the tool would help them to communicate with each other, but this was not reflected to a great extent in the exit survey, although the number of responses to the exit survey was inadequate for reliable statistical analysis. There was a high level of agreement among students, who thought that there would be more structured formal group activities arranged and facilitated by the teacher and this was substantiated by the teachers’ responses in both surveys.

Student entry and exit responses showed a perception that web conferencing would help them to remember what they had learnt, which supports Howland and Moore’s (2002) argument that engagement and active learning enables better knowledge retention. Student enthusiasm was also a key to the success of the real-time e-learning environments confirming Ginns and Ellis’s (2007) notion that positive attitudes tend to correlate with more positive learning outcomes. Although technical issues were a problem for some students, there was not a high level of agreement on this point, and technical skills upon completion were considered to be higher than at the time of entry.

Student comments included:

- ‘I am retired and participating as a learning experience.’
- ‘This is a fabulous opportunity to learn new skills!’
- ‘I am confused, but I shall learn and overcome.’
- ‘Web conferencing should allow students to ask questions and receive answers on issues they may be having in a format which, if all are using at the same time, should save time as everyone can see or hear the question, therefore saving on double ups. Hopefully!’
- ‘Having not done this before I think it will be a trial and a learning curve for me.’
- ‘I am really excited to be a part of this new program and I am looking forward to commencing the course.’
- ‘Elearning is good. I enjoy not having to deal with a classroom environment.’
- ‘I liked using the program but felt all students needed broadband to benefit. Most students had problems with headsets or microphone or both.’

Limitations

Although responses to the teacher and student entry surveys and teacher exit surveys were acceptable, the authors acknowledge that the response rate to the student exit survey was insufficient to draw any statistically significant or valid conclusions, and the study sample was not of sufficient size for generalisation of findings.

Interpretation and conclusion

The findings from the analysis of the teacher and student entry and exit surveys, and the group interview suggest the following.

- Web conferencing involved a high level of participation and interaction on the part of the teacher and students.
- There was a perceived low level of experience in the use of web conferencing among the teachers and students at the beginning, but this skill level increased significantly as a result of its use during the trial.
- The degree to which the identified issues were seen as barriers was not high and those that emerged were resolved.
- The use of web conferencing occurred predominantly in structured group activities facilitated by the teacher.
- There were significant benefits to the organisation to be gained from the use of web conferencing.
- The project was worthwhile for both teachers and students.

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Appendix

Table 1 Teacher entry survey: Experience with and technical barriers to using web conferencing

Item	AV. SCORE
Please indicate the extent to which you have taken part in web conferencing	1.07
Please indicate how you see your current level of skill in using web conferencing in teaching and learning	1.00
The extent to which the following are seen as barriers to the effective use of web conferencing	
Technical barriers	1.00
My existing lack of technology skills	0.73
My lack of time to learn the technology	1.73
Existing lack of students' technology skills	1.93
Lack of funding for hardware, software and/or training	1.87

Note: Scores are measured on a Likert scale from 0 to 4.

Table 2 Teacher entry survey: Application of web conferencing for teaching and learning

To what extent do you think you might use the following capabilities of web conferencing for teaching and learning? Item	AV. SCORE
Collaboration	
Student-directed activities (students using web conferencing to initiate self-directed activities)	1.73
Structured group activities (formal structured activities arranged and facilitated by teacher)	2.33
Facilitated synchronous voice over internet protocol (VOIP) discussions	1.60
Sharing existing documents	2.07
Collaboration in the development of a new document, concept or image	1.93
Content and review	
Content delivery during normal class hours	1.40
Content delivery out of normal class hours (e.g. evening discussion)	2.27
Small quizzes and tests	1.60
Orientation session for a new subject	1.93
Interaction	
Students to student	2.21
Student to teacher	2.71
Teacher to teacher	1.86

Table 3 Teacher entry survey: Benefits of web conferencing

Item	AV. SCORE
Students	2.79
Teachers	2.93
Your organisation	3.00

Table 4 Teacher exit survey: Experience with and technical barriers to using web conferencing

Item	AV. SCORE
Please indicate the extent to which you have participated in the web conferencing	4.20
Please indicate how you see your current level of skill in using web conferencing in teaching and learning	3.4
The extent to which the following were barriers to the effective use of web conferencing	
Technical barriers	3.40
My existing lack of technology skills	1.60
My lack of time to learn the technology	2.80
Existing lack of students' technology skills	2.60
Lack of funding for hardware, software and/or training	2.00

Table 5 Teacher exit survey: Application of web conferencing for teaching and learning

To what extent did you use the following capabilities of web conferencing for learning and teaching? **Item**	AV. SCORE
Collaboration	
Student-directed activities (students using web conferencing to initiate self-directed activities)	2.00
Structured group activities (formal structured activities arranged and facilitated by teacher)	3.20
Facilitated synchronous voice over internet protocol (VOIP) discussions	3.00
Sharing existing documents	2.60
Collaboration in the development of a new document, concept or image	1.60
Content and review	
Content delivery during normal class hours	2.80
Content delivery out of normal class hours (e.g. evening discussion)	2.5
Small quizzes and tests	1.40
Orientation session for a new subject	1.80
Interaction	
Students to student	2.80
Student to teacher	3.60
Teacher to teacher	3.20

Table 6 Teacher exit survey: Benefits of web conferencing

Item	AV. SCORE
Students	3.40
Teachers	3.60
Your organisation	4.00

Table 7 Student entry survey: Application of web conferencing for study

To what extent do you think you might benefit from the following capabilities of web conferencing for your study? Item	AV. SCORE
Collaboration	
Structured group activities (formal structured activities arranged and facilitated by teacher)	3.62
Help me feel part of the class	3.85
Sharing existing documents with students	3.62
Share existing documents with teacher	3.64
Collaboration in the development of a new document, concept or image	3.72
Content and review	
Content delivery during normal class hours	3.61
Content delivery out of normal class hours (e.g. evening discussion)	2.74
Small quizzes and tests	3.15
Orientation session for a new subject	3.74
Help me understand content	3.68
Help me remember content	3.73
Help me apply my learning to the workplace	3.35
Interaction	
Students to student	3.82
Student to teacher	4.13
Study location	
It will allow me to study from home	4.00

Table 8 Student exit survey: Application of web conferencing for study

To what extent did you benefit from the following features of web conferencing for your study? Item	AV. SCORE
Collaboration	
Structured group activities (formal structured activities arranged and facilitated by teacher)	3.25
Help me feel part of the class	4.00
Sharing existing documents with students	2.00
Share existing documents with teacher	2.50
Collaboration in the development of a new document, concept or image	1.25
Content and review	
Content delivery during normal class hours	1.75
Content delivery out of normal class hours (e.g. evening discussion)	2.25
Small quizzes and tests	1.25
Orientation session for a new subject	2.50
Help me understand content	3.25
Help me remember content	3.50
Help me apply my learning to the workplace	2.50
Interaction	
Students to student	3.25
Student to teacher	4.25
Study location	
It will allow me to study from home	3.54