

Teaching via video conference – comments and observations and the attainment of graduate attributes and learning outcomes.

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***Abstract:** The author taught an engineering course at the School of Engineering and Information Technology; University of New South Wales at the Australian Defence Force Academy, when the author was on an exchange posting at the United States Air Force Academy, Colorado Springs; Colorado. This paper describes the method of teaching this course via video conference. In this instance, teaching via video conference is markedly different to the techniques employed in distance education. This paper will describe the experience of teaching via video conference as well as some of the perceived shortcomings and pitfalls of being a ‘talking head’. The paper also describes some of the techniques developed in order to ameliorate some of the perceived difficulties of teaching via video conference. The results of a student questionnaire and the overall learning outcomes will be discussed with reference to University of New South Wales, Canberra and Engineers Australia graduate attributes.*

Introduction

According to Jyoti and Spector (2009), online instructors need to take on a multi-dimensional rôle and to be an effective online educator they are required to possess a varied and wide range of competencies. Their extent of utilization relies on the context or rôle they are required to perform and also the kind of resources and support available. The aim of this paper is to report and comment on the experience of teaching an introductory aviation course via a video conference format. While there were limitations imposed on the video conference teaching method by the lack of preparation time and the ad-hoc nature of the equipment setup, this paper will focus on whether, in this instance, it was possible for students to achieve desired learning outcomes and attain and demonstrate Engineers Australia and University graduate attributes.

It must be stressed that the video conferencing experience is quite different to distance education. According to Moti and Barzilai (2004) distance learning tends to be characterised by a “fully on-line asynchronous course” where there may be very limited or no classroom sessions (p 34). The video conferencing teaching paradigm – the subject of this paper – employed a course web site with synchronous distance learning. In this case, teaching resembled traditional face-to-face teaching yet the teacher and the students were physically very distant from each other.

Background

While on an exchange posting at the United States Air Force Academy [USAF A], Colorado Springs, Colorado, the author was unexpectedly called upon to teach a course in the aviation program at the University of New South Wales, Canberra [UNSW Canberra].

The aviation program at UNSW Canberra is the only aviation degree program accredited by Engineers Australia. The course, Introduction to Aviation – provides an introduction to flight. Within an historical framework, the student is introduced to the basic science of flight with regard to the development of aerofoils, airframes and propulsive technologies. When delivered in a traditional lecture theatre environment, the lectures are designed to highlight key areas in the advancement of

aviation as a discipline. As well as being a core course for pilot candidates undertaking a Bachelor of Technology (Aviation) degree program, the course is offered to other undergraduate students at the UNSW Canberra as a general education course.

In preparation for this course, which was to have been delivered by an exchange professor from USAFA, a repository of course material – was set up in a University-sponsored website. Fortunately, in preparation for the ‘hand-over’ to the American professor, the author had arrived at USAFA with an electronic copy of most of the Introduction to Aviation lecture material.

Using a website (course supported site) as a teaching resource can itself be problematic. Dehoney and Reeves (1999) reported on a study that found that most university web-based resources were static web pages containing course information and syllabus material. Such was the case with the web-based material for Introduction to Aviation. It was planned that when the American professor took over the course in Australia, he would re-engineer the course material and web-based course material and bring to the course his experience and teaching expertise. In the teaching paradigm where the video conferencing format was adopted at short notice, the course-supported website was used solely as a repository of course material.

Video conferencing, as a term, embraces many technologies and communication styles. In the past, the technology encompassed microwave transmission, satellites, optical fibres and ISDN (Coventry, 1995). Initially, the use of ISDN (dedicated telephone-line connection) was considered in order to accomplish video conferencing between USAFA and UNSW Canberra - two institutions that both use defence-related security firewalls. In recent times, video conferencing involves the use of video and communication via internet and a dedicated internet service provider (ISP) server. For the video conferencing to occur between USAFA and UNSW Canberra, a dedicated firm of software managers; ISP and consultants were employed. The program name is Nefsis and the team of consultants is based in San Diego, California. Because Nefsis uses a dedicated ISP, communications are claimed to be secure and are therefore not blocked by defence-related security firewalls.

Hardware Equipment

At UNSW Canberra, a seminar room was equipped with a Logitech 9000 web camera. This web cam is the recommended Nefsis equipment as the Carl Zeiss lens provides excellent picture quality. After experiencing voice communication problems within this room, a portable press-to-talk wireless microphone was installed and the inbuilt web camera microphone deactivated. The use of the hand-held, press-to-talk microphone – passed around the seminar room – allowed students to ask questions of the lecturer and conversely, answer the lecturer’s questions during lecture presentations.

At USAFA, the lecturer’s laptop computer was fitted with the Logitech 9000 web camera and a Plantronics Audio 610 single-ear microphone and headset (again, equipment recommended by Nefsis).

Software Equipment

The Nefsis software allows the distant lecturer to display PowerPoint presentations; video files (when codec compatible); draw and write on a whiteboard; and ‘chat’ via a written ‘chat room’ interface. The last was useful when audio ‘dropped out’. The presenter is also able to allow the classroom the same management rights to all the Nefsis modes. This feature enables students to present to the class and the distant lecturer via all the Nefsis modes.

Video conferencing as a teaching medium

Coventry (1995) makes the point that the success of video conferencing is highly dependent on the teaching methods adopted. The video conferencing environment differs from the traditional teaching setting in several ways that may have an effect on the method of delivery and presentation of the course. For video conferencing to be effective it must be borne in mind that students are looking at the lecturer on a screen and are not in the same room. Also, visuals and graphics may be displayed differently to the presentation that is normally viewed in a traditional lecture theatre/classroom.

Coventry (1995) asserts that in video conferencing course preparation and planning, one needs to become familiar with the equipment, take into consideration the fact that students are under different learning conditions and redesign visual aids for use with the system. Also one needs to consider how the organisation and management of the course will change.

The task, as described by Coventry (1995), is to determine the extent to which video conferencing, with two-way video, can provide the psychological attributes of face-to-face encounters. It is reported in the literature that eighty per cent of human communication is via body language (Hawkins 1987). In fact, many researchers have reported on the difficulties that arise from a lack of eye contact between teacher and student. Willis and Dickinson (1997) maintain that teachers may not be effective if they are not able to maintain eye-contact with their students or are not able to observe students' non-verbal behaviour.

The Video Conference Teaching Experience

The initial experience of teaching via video conference was problematic. It took several lectures to overcome hardware and software problems. The introduction of a hand-held, press-to-talk microphone – passed around the seminar room by the students – solved many of the audio feedback problems experienced by whoever was talking – student or lecturer.

The lecturer developed the very strong perception that he had become a 'talking head'. Without the ability to adequately view the students' body language and non-verbal behaviour, lecture material was delivered more quickly than in face-to-face teaching. Without the ability to perceive a raised eyebrow or a furrowed brow of non comprehension, the natural pauses and the further explanations involved in face-to-face teaching were absent.

The perception of the lecturer as a 'talking head' was ameliorated, to some extent, by asking the students many more questions than would have been normally asked during a traditional lecture format. These questions pertained to the course material – the prescribed pre-reading and also questions about the student comprehension of what was required of the assignment tasks. In order to increase the level of student engagement, the lecturer prepared PowerPoint slides of questions which were answered by students as they passed the microphone around. Even with the use of the recommended webcam, recognition of individual students was difficult. With the benefit of hindsight, lecturer availability of student photographs may have made interaction easier.

In order to overcome the perception of the 'talking head' the lecturer tasked pairs of students to recover various pieces of equipment from university display cabinets and workshop storage areas. One such piece of equipment was the model of the novel device, invented by the Wright brothers, whereby they tested 130 or so aerofoil sections in their wind tunnel - see figure 1. Assigned pairs of students were instructed to read about the particular device and then to demonstrate the device to their classmates during the video conference lecture period. In this manner, gas-turbine combustor cans; propellers; models of iconic aircraft; spinning bicycle wheels (to demonstrate gyroscopic precession forces) became part of the lecture content delivered to the students by the students.

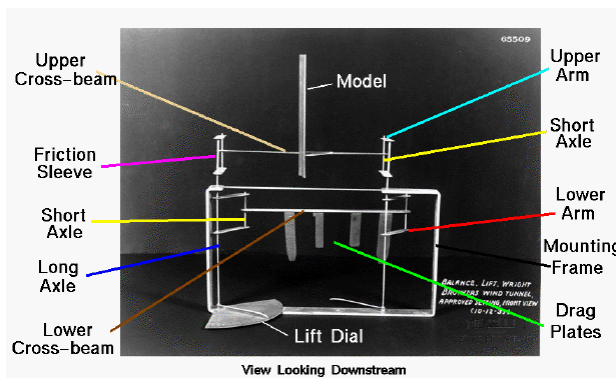


Figure 1: Example of 'Prop', the Wright Brothers Lift Balance

[Source: www.grc.nasa.gov/.../wrights/balance.html]

It is claimed that educational outcomes and EA graduate attributes were enhanced by this teaching stratagem. Students had to gain the theory and application of the particular piece of apparatus as well as to demonstrate an ability to effectively communicate the theory and application to their peers. Also, this teaching stratagem required the student to demonstrate the EA educational outcome of being an effective team member.

The administration of the video conferencing course required the co-operation and assistance of university administrative staff at UNSW Canberra. Test and exam papers were scanned by university administrative staff and e-mailed to the lecturer in Colorado Springs. Student essays and assignments were e-mailed to the lecturer who scanned the corrected text (with comments and feedback) and e-mailed the document to the student.

The results of the test and exam papers indicated that the EA educational outcomes of ‘an ability to apply knowledge of basic science and engineering fundamentals’ were achieved, (Bradley 2005 p7). In general, student results in the tests and exams were in accordance with the results achieved in previous years when the course had been delivered in a face-to-face classroom environment.

The essay assessment required that a student demonstrate an ability to critically analyse an aviation-related topic. For example, ‘the contribution or otherwise of Lawrence Hardgrave to the success of early flying machines’. Notwithstanding the delivery of essay writing skills briefings via video conference, the submitted essays were good examples of EA educational outcomes in that the students demonstrated an ability to undertake problem identification, formulation and solution. In short, the essay assessment did not suffer as a result of the video-conference experience.

Among the graduate attributes of the UNSW Canberra are the skills of effective communication; the skills required for collaborative and multidisciplinary work as well as an appreciation of, and responsiveness to, change (UNSW Secretariat 2010). To foster the skill of effective communication and collaborative work, the students were tasked with presenting to their classmates the results of their research and investigations into tutorial questions. The lecturer set the questions and (broadly) designated the material to be covered; the students paired into working partnerships and chose their particular question to answer. The use of multi-media, within the Nefsis program, to present the results of the tutorial question was encouraged.

Assessment of this part of the course was accomplished by setting up a laptop (equipped with built-in webcam) on a classroom desk so that the lecturer could view the students’ presentations as if he were sitting at that desk in the seminar/conference room. The lecturer’s laptop presentation (at the Colorado Springs end) is shown in figure 2.



Figure 2 Lecturer’s laptop showing students’ Powerpoint presentation; the in-class laptop ‘view’; the classroom camera view and the view of the lecturer [as a small insert].

As well as fostering the UNSW Canberra graduate attributes, the student presentations of the results of their research and investigations into tutorial questions, prepared and presented as a member of a team, satisfied many of the educational outcomes of Engineers Australia, (Bradley 2005 p7).

The student questionnaire

In order to measure the students' evaluation of the video conference as a method of teaching, toward the end of the course the students were administered a questionnaire containing two Likert-scale questions and four questions that allowed them to express a qualitative evaluation of the video conference format. This questionnaire is attached to this paper as Appendix A.

Results

The responses to the two Likert-scale-type questions on the *video conference as a method of teaching* questionnaire were collated and are shown in Table 1.

Table 1: Summary of Data: (Descriptive analysis): The Video Conference as a Method of Teaching: Percentage of total respondents (actual number of respondents, n = 20)

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I consider that the video conference is a successful method of teaching	5% (1)	45% (9)	30% (6)	20% (4)	0% (0)
I would prefer face-to-face classroom teaching	40% (8)	30% (6)	25% (5)	5% (1)	0% (0)

In response to the question: 'I did not request a personal video conference session with the lecturer because', 50% (10) responded 'no need'; 20% (4) responded 'not comfortable with format' and 30% (6) cited 'other reason'.

In summary, 50% of students considered that the video conference is a successful method of teaching with 20% in disagreement to the question. 70% of students indicated that they preferred face-to-face classroom teaching.

Interestingly, the lecturer issued many invitations to the students to avail themselves of a personal video conference tutorial. This feature of the Nefsis program was promoted as a key to high lecturer-student engagement. In fact, no student sought a one-on-one video conference with the lecturer. In response to the questionnaire question 'I did not request a personal video conference session with the lecturer because', 10 students responded: 'no need'; four reported that they were not comfortable with the format and six cited 'other reasons'.

In response to the qualitative questions regarding what the students liked or disliked or what could be done to improve video conferencing as a method of teaching, several students reported frustration with the hardware and software when it came to making their own class presentations.

Conclusion

The technology of video conferencing has advanced rapidly in recent years. Picture and sound quality of room-based systems are reasonable and the costs of installing and running them are such that they are now becoming a realistic option for institutions teaching across more than one site. The growth of network technology and in particular the internet has led to a greater awareness of the potential of conferencing systems for teaching, collaborative work, assessment and student support.

In this reported example of teaching a core aviation course – Introduction to Aviation – both lecturer and students worked co-operatively to master a new (to the participants) technology whilst achieving desired learning outcomes. Skills involved in scholarly enquiry; skills required for collaborative work as well as the skills of effective communication were fostered and demonstrated in the results of the assessment items.

In reporting on this example of video conferencing as a method of teaching, the level of co-operation between student and lecturer was greater than ever experienced by the author in a face-to-face

teaching situation. It may be that both parties – students and lecturer - were aware that co-operation was required for this delivery method to succeed. The students voluntarily shared responsibility for the successful delivery of the course and the student-lecturer authority gradient became less steep than that normally experienced in face-to-face teaching.

The literature on video conference as a teaching medium reports the necessity of having a colleague in the student classroom (Coventry, 1995). This colleague would operate and supervise the required equipment and ensure the smooth operation of the software. In this instance such a colleague was not available. Student co-operation notwithstanding, the author supports the suggestion of Coventry (1995) that it is preferable that a colleague be present in the student classroom during video conference teaching, especially with larger class sizes. In this instance of teaching via video conference the class size was small - 20 students - therefore it was possible to monitor the entire class. It is realized that this may not be possible with large class sizes.

In this example of video conferencing as a method of teaching there were occasions when the passing of the microphone around the class caused delays and what seemed to be a reticence to speak – spontaneity was stymied. An improvement in student – lecturer – class communications may be achieved if more in-class microphones were made available to the students.

The student responses to the questionnaire indicated that the students were equivocal about the success or otherwise of video conferencing as a method of teaching. The reported problems associated with an unfamiliar technology were cited as the main reason for not feeling comfortable with video conferencing as a learning medium. With practice and familiarity many such problems would be solved however, in general, it is believed that University and EA graduate attributes were achieved in this instance of using video conferencing as a teaching medium.

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Appendix A

The Video Conference as a Method of Teaching

I consider that the video conference is a successful method of teaching [circle one below]

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
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I would prefer face-to-face classroom teaching [circle one below]

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
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I did not request a personal video conference session with the lecturer because: [please tick]

- No Need
- Not comfortable with format
- Other Reason [Please specify]

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What did you **like** about video conferencing as a lecture format?

What did you **dislike** about video conferencing as a lecture format?

If you were the lecturer using a video-conferencing format what changes would you make?