Inside the Virtual Classroom: Student Perspectives on Affordances and Limitations

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Abstract

Research indicates learners studying at a distance can experience perceptions of isolation and lack of 'belonging' and support, which can adversely affect their learning experience and performance. Recently, the advent of affordable, accessible and reliable high-speed broadband has meant that a whole new array of digital tools to support synchronous interaction between students and tutors engaged in online learning have become viable, thereby potentially helping to address some of these issues.

This paper presents findings from a study involving postgraduate students using the Adobe Connect and Wimba Live virtual classrooms to present a series of seminars as part of Waikato University's Postgraduate Diploma in Education. It explores students' perspectives of the value of the classrooms for building relationships and supporting communication and interaction, and examines factors that influenced this. Results show that while virtual classroom use was viewed favourably, its value was influenced by task, communication tools, multimedia usability and technical/logistical factors—some of which were beyond student control. These factors will be explored and discussed, with recommendations being presented for teachers considering using virtual classrooms to support their online distance learning programmes.

Keywords: synchronous; virtual; classroom; interaction; isolation; presence; dialogue

Introduction

Extensive research exists highlighting the importance of interaction, communication, and relationship formation in distance learning (Collis, 1996; Gosmire, Morrison & van Osdel, 2009; Picciano, 2002). However, since the early days of distance education, there have been issues apparent in terms of how this can best be achieved with learners who are geographically dispersed. Research indicates that learners studying remotely can suffer from perceptions of isolation and psychological distance—and these perceptions can negatively affect their performance and contribute to course retention issues (Moore & Kearsley, 1996). Recently, technology access and performance improvements have opened new possibilities for educators and students to interact and communicate in ways that more closely resemble face-to-face scenarios, using improved technology in synchronous environments such as virtual classrooms or GooglePlus. However, relatively few educators have explored this potential, instead opting solely for more conventional asynchronous systems such as Moodle, Blackboard Learn, or Desire2Learn.

This paper reports on the use of two examples of online virtual classrooms—Adobe Connect Pro and Wimba Live Classroom (now Blackboard Collaborate)—in postgraduate education programmes at the University of Waikato.

The research questions guiding data collection were:

1. What were students' perceptions of the effectiveness of the virtual classrooms for supporting interaction, communication, and relationship development?
2. What factors influenced students' ability to use the virtual classrooms for these purposes?

Interaction in online distance learning

While the benefits of interaction in distance learning are well known (Collis, 1996; Haythornthwaite, 2002) work still needs to be done as to how to best achieve this (Gunawardena & McIsaac, 2004). Early work by Moore and Kearsley (1996) highlights issues distance learners face with isolation, brought about by what they describe as *transactional distance*, or "a psychological space of potential misunderstanding between the behaviours of instructors and those of learners" (p. 200). Moore and Kearsley comment on the need to balance learner autonomy and course flexibility with a level of planned interaction that is sufficient to establish quality teacher–learner dialogue, supportive of learning community and relationship formation. This perspective is supported by a 2004 study by Hay, Hodgkinson, Peltier and Drago, who compared student perceptions of the importance of tutor–student and student–student interaction in face-to-face and online post-graduate business management degree programmes. They found that, overall, students perceived tutor–student interaction as being "the stronger of the two interaction measures in terms of predicting effectiveness for both types of delivery" (p. 200) but that, in the online context, student–student interaction accounted for more variance in overall effectiveness than it did in conventional classrooms. They speculated that this might indicate online learners rely more on each other to support their learning.

Another study by Garrison and Cleveland-Innes (2005) explored the qualitative aspects of online learner interaction. Their study was motivated by a concern that "high levels of interaction may be reflective of group cohesion, [but it may] not directly create cognitive development or facilitate meaningful learning" (Garrison & Cleveland-Innes, 2005, p. 135). Their results, based on an analysis of the Study Process Questionnaire administered to 75 graduate students, concluded that teacher presence and interaction modelling critical discourse was fundamental to promoting deep learning in online contexts. They found that while informal and social interaction were both important for relationship establishment and learner security as prerequisites for deeper learning, by themselves they appeared insufficient to ensure such learning occurred. Garrison and Cleveland-Innes (2005) concluded that online learning interaction needs to be structured, planned and sustained, and that teachers must be prepared to take a leadership role by designing into their courses the opportunity and requirement for such interaction, as well as modelling it themselves.

Synchronous and asynchronous interaction in online distance learning

Over the last decade, educational institutions have turned to the internet as the primary mechanism for providing their distance learning offerings, using an array of asynchronous learning management systems. While such systems are an enhancement of previous methods, they still offer limited options for interaction, and these are usually restricted to online forums and discussion groups, or text-based 'chat' rooms (Allen & Seaman, 2004; Anderson, 2003; Snyder, Tan & Hoffman, 2006).

However, recent studies have identified a role for both synchronous and asynchronous online systems to support learners studying at a distance (Falloon, 2011a, 2011b; Hrastinski, 2008). Hrastinski (2008) compared the type of student interaction on asynchronous discussion forums with that of the same group using synchronous chat. He used an adaptation of Haythornthwaite's (2002) framework that identified three types of interaction necessary in online distance learning (ODL)—content-related, task planning, and social support. After analysing the oral discourse of two student groups, his results indicated a predominance of content-related interaction on asynchronous forums, and social-support interaction in the synchronous chat environments. In discussing results in relation to Kock's (2005) media naturalness hypothesis (the extent to which the medium used resembles face-to-face communication), he commented that synchronous communication appeared to "increase psychological arousal" (Hrastinski, 2008, p. 53) through its ability to convey information that characterised natural media (e.g., immediacy, feedback, facial or verbal expression, body language). He suggested students may have felt more disposed towards using the synchronous chat to "exchange social support and discuss less complex issues . . . since this type of communication more closely resembles face-to-face interaction" (p. 54).

Hrastinski concluded that, in making decisions about the communication tools selected by online teachers, it was a matter of 'horses for courses'. Asynchronous environments appeared better suited to promoting deeper cognitive engagement such as that advocated by Garrison and Cleveland-Innes (2005), while synchronous environments supported less formal, or social, engagement—both of which are necessary for a successful ODL experience. Similar outcomes were reported in earlier studies by Wang and Newlin (2001) and McInnerney and Roberts (2004), who concluded that synchronous tools assisted learner socialisation and interaction, helped establish a sense of learning community membership, and mitigated feelings of isolation.

The following study explores students' perceptions of using one of the most recent of these synchronous tools—the online virtual classroom—in their ODL courses. It investigates their views on the influence of the classrooms on group interaction, communication, and relationship development, and identifies factors that affected these.

Research context

This study took place in the second semesters of the 2010 and 2011 academic years (July–November) and involved two groups of students studying totally online for their Postgraduate Diploma in Education. In total, 22 students undertaking the paper PROF522 – The Professional Practice of eTeaching, were involved in the study (12 in 2010 and 10 in 2011). Most interaction during the paper was in Moodle, the university's online learning platform. This interaction comprised asynchronous discussions via forums on course topics, synchronous text-based chat at scheduled times, and asynchronous, less formal spaces for students to interact and 'chat' casually ('café' spaces). In 2011, these were supplemented by Wimba Voice, which allowed students to post messages and respond to forum postings by generating audio files that could be streamed to others. A typical course layout is shown in Figure 1.

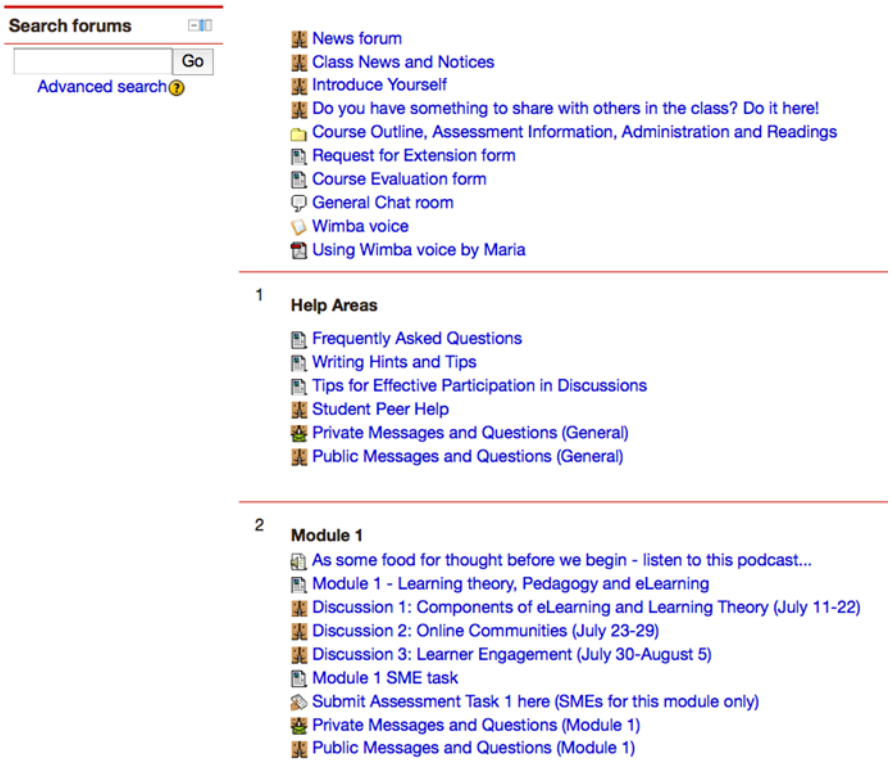

Figure 1 A typical Moodle course layout for PROF522(NET) 10 and 11B

During the 2010 paper, four Monday or Tuesday evening sessions using the New Zealand Ministry of Education's Adobe Connect virtual classroom were scheduled and, in 2011, three sessions were held using the Wimba Live classroom. The platform change was prompted by the university having the opportunity to trial Wimba for 6 months during 2011. Classroom use focused on an assessed seminar students were required to complete, and which explored the potential of e-learning for a selected stakeholder group. One session was used for 'practice' (students and teacher could problem-solve any technical difficulties) while, in the remaining two sessions, students presented outcomes from their research. An extra session was held mid-course with the 2010 group to introduce discussion topics, and to provide formative feedback on the paper after its revision from the previous year. In 2011, a trial classroom was also made available to students who wished to test their seminars with others and receive feedback before the actual presentation date.

The virtual classrooms

The term 'virtual classroom' has been used to describe a variety of online learning environments. These range from asynchronous systems such as those described previously, interactive learning spaces established in virtual worlds such as Second Life (Masters & Gregory, 2010), and synchronous systems where participants are able to engage in 'live' virtual meetings, and communicate using multimedia services such as streamed video and audio. Figure 2 illustrates a typical presentation layout for the two classrooms used in this study. While Adobe Connect and Wimba have features in common (such as a shared whiteboard space, voice-over IP, video streaming, file and desktop sharing, text-based chat, polling, and participant Q&A and feedback capabilities) there are some fundamental differences in how some of these services operate. The main difference is with video handling—Wimba allows streaming of the image of only one person at a time (the presenter); whereas, in Connect, the whole group can be visible when elevated to presenter status. Both platforms allow archiving of content and recording of meetings

for later review. While it is not the primary purpose of this article to compare and contrast the two platforms, data indicating specific features that have influenced students' perceptions will be included and discussed.

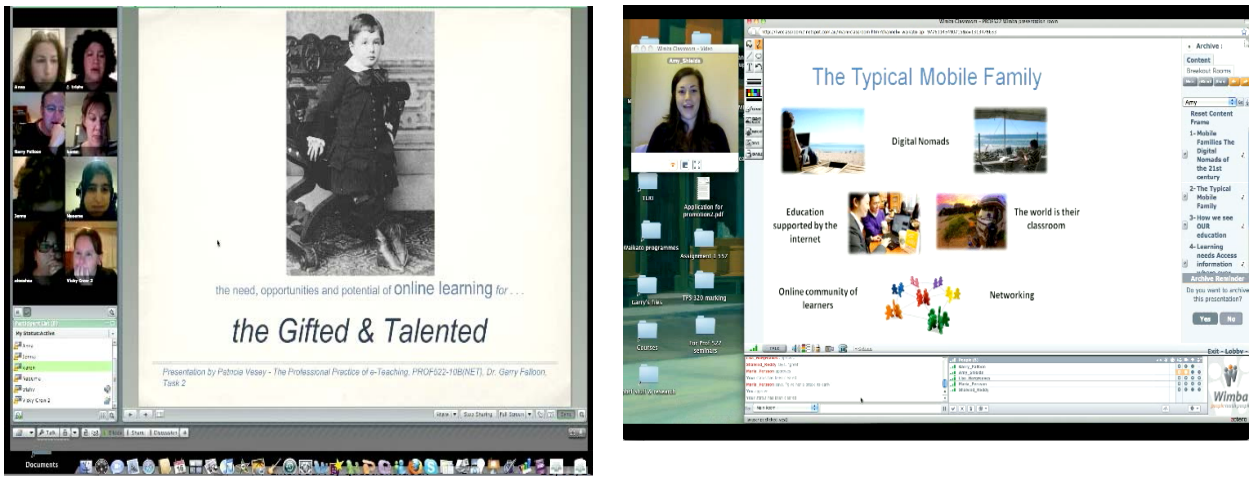

Figure 2 Typical layout of the two virtual classrooms: Adobe Connect Pro (left) and Wimba Live (right)

Research method and data coding

This research adopted an interpretive case-study methodology and used mixed qualitative/quantitative tools for data collection. These were:

1. semi-structured interviews, undertaken at the conclusion of both papers—to avoid possible conflicts of interest, these were scheduled after course grades had been calculated and communicated to students (see Appendix A)
2. an anonymous mixed Likert-scale/short-response online questionnaire (see Appendix B)
3. screen recordings of each session—Where students referenced specific aspects of, or made comments in relation to, the sessions in interviews or questionnaire responses, these were reviewed and relevant data noted.

The interviews were completed and transcribed by the researcher and an assistant. The transcripts and questionnaire summaries were duplicated and copies coded independently for initial themes by the assistant and the researcher, following Braun and Clarke's (2006) inductive Thematic Analysis framework. Following an initial appraisal, the researcher and assistant met and discussed results.

After discussion, the following broad themes across data, and responding to the research questions, were identified:

1. student perceptions of the effectiveness of the virtual classrooms for learning community consolidation (relationships), and for communication and sharing knowledge
2. influences on the students' ability to interact and communicate in the virtual classrooms. These comprised task influences (purpose for use); multimedia-usability influences (ability to use different integrated multimedia options); synchronous communication tool influences (using the integrated synchronous communication tools); and technical/logistical influences (technical setup and general organisation).

Coding decisions were then further refined before final collation. In presenting the findings, qualitative data (interviews and written survey responses) have been used to illustrate, more

specifically, students' reasons for their Likert ratings, and to probe more deeply into their perceptions of the limitations and affordances of the classrooms and issues they experienced when using them. The research complied with university ethical requirements and, when presenting data, names have been substituted by letters to maintain anonymity.

Table 1 provides a summary of results from the Likert component of the questionnaire. Results have been entered as numbers of students rating each statement from 1 (strongly negative) to 5 (strongly positive), in addition to an average rating calculation across all students (Av.). Responses to other question types such as 'Yes/No' (12, 13, and 14) and informational questions (8, 15, 17, and 19) are summarised in Table 2.

Results and findings

Theme 1: Learning community consolidation, communication, and sharing knowledge

Questionnaire data in Table 1 indicates students viewed using the classrooms as enhancing their perception of membership of a learning community, and as supporting relationship development between group members. Student responses to statements 4 (19/22), 5 (13/22), and 9 (17/22) pertaining to these factors were rated at 4 or 5, indicating they viewed the classrooms as valuable for relationship development and fostering cooperation, and that they assisted in lessening their sense of isolation. Interview responses provided some insights into reasons for this.

Twelve students commented that the visual and oral nature of interaction possible in the classrooms had the effect of promoting a sense of responsibility and commitment towards others in their group, and in some ways made them feel *obligated* towards helping them. Comments indicated synchronous interaction 'personalised' a relationship that had formed through the asynchronous forums in Moodle, and that the added dimensions of sight and sound helped consolidate these at a more personal level. As student A commented:

> [the time in the classroom] automatically humanised everyone to each other. So up 'til then you get these preconceived ideas in your head . . . because we had already contributed [asynchronously], but once we had them in the classroom it's almost like meeting the person face-to-face, and you felt like you wanted to contribute more because *you wanted them to do well, and not just yourself* [emphasis added].
>
> (Student A, interview transcript, November 2011).

Some students commented that much relationship formation groundwork had been done prior to the classroom sessions, and that they served more to consolidate or evolve existing relationships to a different level. Eight students commented on the uniqueness of their group in this respect, in that they had found establishing professional relationships a relatively easy process from the outset—something that they had not experienced in other online learning situations. These students typically saw the classrooms more as a bonus than an essential tool for establishing relationships, with one commenting, "after having all those other online experiences (forums etc.)—our particular community of learners—we connected at different levels… those connections were well and truly entrenched. Once we got to the synchronous environment, that was a bonus". (Student E, interview transcript, November 2011).

Table 1 Likert questionnaire summary: Results from PROF522(11)NET and PROF522(10)NET (n=22)

Statement	Likert rating						Av	Total (%/n)
	1	2	3	4	5	NA		
1. Please indicate the extent to which you consider using the virtual classroom was a worthwhile experience in this paper		1	5	8	8		4.04	100(22)
2. What effect did the use of the virtual classroom have on your perception of other course members?		1	6	9	6		3.9	100(22)
3. What effect did the use of the virtual classroom have on your perception of the course tutor?			6	7	9		4.13	100(22)
4. What effect did the use of the virtual classroom have on your perception of being part of a community of learners (belonging)?			3	11	8		4.22	100(22)
5. What effect did the use of the virtual classroom have on your sense of learner isolation?			8	9	4	1	3.8	100(22)
6. What effect did using the virtual classroom have on your studies?		1	7	8	6		3.86	100(22)
7. Please indicate your level of support for using the virtual classroom more frequently in courses such as this.		4	5	8	5		3.63	100(22)
9. What is your perception of the virtual classroom as a tool for student collaboration?			5	9	8		4.13	100(22)
10. How easy was it for you to communicate your thoughts and knowledge using the virtual classroom?	2	6	5	6	3		3.09	100(22)
11. What effect did using the virtual classroom have on your learning?			2	12	8		4.27	100(22)
16. What is your perception of the adequacy of the performance of the virtual classroom (eg: quality of audio, video, speed of content delivery etc.?)		3	5	10	4		3.68	100(22)
18. How convenient for you was the timing of the virtual classroom presentations?		3	4	11	4		3.72	100(22)
20. What effect did the prior distribution of presentation outlines have on your ability to ask questions or otherwise engage with and understand the presentations?			8	12	2		3.72	100(22)

Interestingly, responses to statement 10 about ease of communication indicated that the number of students who experienced difficulties in adequately communicating their findings during the seminars was approximately the same as the number who didn't, while five offered neutral responses. Interview data revealed this mediocre result was partially linked to issues with how the video operated (particularly Wimba), in that it did not provide students with visual feedback from the group when they were presenting. While data from the 2010 cohort using the Connect classroom did not indicate this to be such a concern, it was still an issue for some. Students remarked that the small size of the thumbnail image in Connect meant registering any visual cues to improve their performance was virtually impossible. As one commented: " [the images] are so small, it's hardly worth having them. You can't really make out how [the presentation's] going

from them . . .” (Student H, interview transcript, October 2010). In the case of Wimba, the total absence of any whole group visuals was distracting for some, with one student likening it to: “lecturing into cyberspace. It’s the first time I’d experienced [the virtual classroom], and I found it a bit strange just talking into the ether”. (Student C, interview transcript, November 2011).

Students also indicated that the structure of the seminar did not encourage interaction. Twelve commented that the best use of the classrooms would be in scenarios that required two-way exchanges, and that the seminar model used in their courses did not support this. Students valued the affordance of the classrooms for supporting use of a range of different communication tools in their seminars, but suggested such use could have been enhanced by designs that allowed for more verbal interaction. Student K summarised the opinions of the group well:

> [the classroom’s] a really useful tool. It made us do things differently. We got to use the stuff we were learning about—and it helped, because we could use diagrams and voice and videos and things like that to show what we’d learned . . . the only thing I should say is that it would’ve been good to have gotten [sic] more feedback . . . you know . . . questions or comments from others. This needs to be built in somehow.
> (Student K, interview transcript, October 2010).

The feedback potential of the classrooms was mentioned by 18 of the 22 students. They commented particularly on the text-chat pods and the value these offered for sharing ideas and comments, both publicly and privately. These responses are supported by questionnaire data that rated the text-chat function second only to audio in tool value ranking (Table 2). However, while most appreciated its usefulness, some found it off-putting, claiming it distracted them while they were presenting. Four made remarks to this effect in their interviews, with one commenting that the constant activity drew her attention away from her presentation as, “it caught my eye all the time . . . flashing away in the bottom corner. I wanted to see what they were saying about my work . . . it was hard to concentrate”. (Student G, interview transcript, October, 2010). Others appeared uncertain about how the pod worked, and who was able to see what and when - “. . . I couldn’t work out what the little bit down in the corner was (the chat pod). I thought it could be distracting for some people”.
(Student F, interview transcript, November 2011).

Six students commented on the limitations of classrooms if the expectation was deep understanding generated through reflective thinking. These students considered that, where deeper and more comprehensive knowledge was an objective, asynchronous modes performed better. Ironically, data linked this perspective to the very benefit often cited for using virtual classrooms—that is, the value of synchronous interaction. These students indicated that the immediacy of interaction did not allow them opportunity for reflective ‘thinking time’, and that this affected their ability to ask questions they considered worthwhile. One commented that they saw the classroom as “a good place to introduce topics or wrap up” (Student L, interview, October, 2010), while another highlighted the difficulty of keeping up with the onscreen activity: “the synchronous is harder to organise and doesn’t allow you to have that reflective thinking going on as you’re involved in it so much . . . and you don’t have that time gap you can respond . . . there’s so much going on”. (Student F, interview transcript, November 2011).

Theme 2: Influences on students’ ability to interact and communicate in the virtual classrooms

Data in this theme were coded under four interrelated sub-themes. These were: task influences, multimedia-usability influences, synchronous communication tool influences, and technical/logistical influences. Figure 3 illustrates the interrelationships between these four sub-themes.

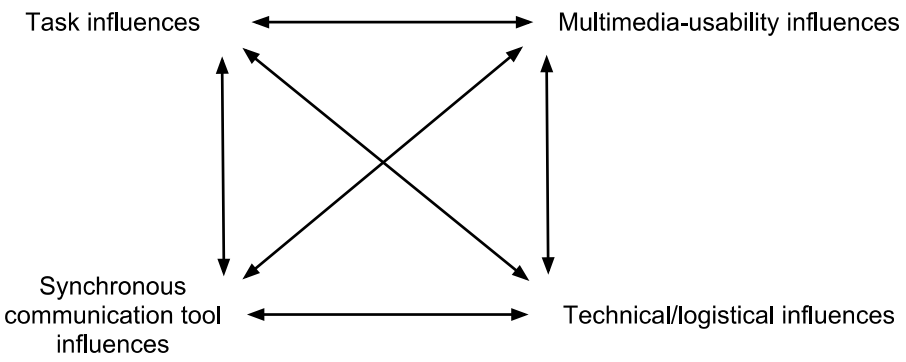

Figure 3 Relationship between influences on students' ability to communicate and interact in the virtual classrooms

1. Task influences

Data coded under this sub-theme referred to student views of how well the classrooms supported the purpose to which they were put, and any affordances or limitations to this. Questionnaire data indicated most students considered using the classrooms for seminars to be appropriate and worthwhile (16/22 rating statement 1 at 4 or 5), but interviews revealed that some students considered that the way the seminars were structured did not make best use of their synchronous capability. The data suggested that there is a need to blend significant offline preparation with synchronous online interaction, so that what goes on in classrooms represents deeper, more meaningful learning, rather than shallow, superficial interaction. To facilitate this, it was suggested that seminars should be spread out over more evenings with fewer on each, presentations and supporting notes should be made available in advance to allow others to review them and generate useful feedback and questions, and there should be more time for follow-up discussion after each seminar.

Furthermore, six students commented that they saw potential for independent student use of the classrooms outside the more formal purposes integrated within courses. Remarks indicated that students identified value in classroom use for student-led tutorials, introducing and summing up learning modules, and for collaborative development of assessment tasks. However, while supporting such activities, some cautioned against over-use and the effect this could have on learner choice and flexibility—two of the main reasons they opted for ODL in the first place. Such views were well represented by Student I, who stated:

> It's a bit of a trade-off really. On one hand it's really good being able to work together and share ideas using tools like the classroom, but if it was too often it would be a bit of a bind. After all, we choose to do courses online because it gives flexibility—we can work around other things—so if we had to turn up every week or every 2 weeks even, it takes a lot of that away.
> (Student I, interview transcript, October 2010).

This perception was supported by questionnaire results that indicated most students favoured a maximum of three or four sessions of up to 1½ hours in duration over a 12 week, semester-long course (see Table 2).

Table 2 Questionnaire summary: Technical, logistical and communication tools

Technical and logistical

8. Please indicate how frequently you would be prepared to participate in virtual classroom use (for example for tutorials) over a typical 12-14 week course	# sessions	<2	2	3	4	5	6	>6
		0	4	7	7	2	1	1
12. I had to purchase additional computer equipment to enable me to participate in the virtual classroom?	No		Yes					
	16		6					
13. I needed to make special logistical arrangements to enable me to attend the virtual classroom sessions (eg: childcare, travel to access a landline, borrow a computer, upgrade my internet etc.)	No		Yes					
	10		12					
14. I had technical issues connecting to the virtual classroom	No		Yes					
	12		10					
17. Please indicate your internet connection speed if known	Broadband (128k up & down)		Broadband (max up & down)			Don't know		
	8		8			6		
19. I consider the maximum duration for a virtual classroom session should be...	<30 mins		30-1hr		1-1.5hr	1.5-2hr		>2hrs
	3		4		9	4		2

Ranking of virtual classroom tools

	Feature	Total score	Rank
15. Please rank your opinion of the technical features of the virtual classroom in order from 1 to 7 (least to most valuable)	Audio	53	1
	Text chat	52	2
	Video	48	3
	Shared whiteboard (powerpoint, drawing etc.)	40	4
	Feedback grid (hands up, thumbs up etc.)	37	5
	Content archive	27	6
	Participants list	23	7

2. Multimedia-usability influences

Data coded under this sub-theme referenced feedback relating to the range of multimedia that can be used in the classrooms to communicate knowledge, and the benefits and frustrations associated with using them effectively. These data closely aligned with technical influences, as technical know-how proved an essential requirement supporting communication through effective multimedia use. It was apparent that a number of students felt disadvantaged by a lack of technical knowledge about how the classrooms worked—specifically, how to make best use of their multimedia support capability for their seminars. Such functionality included video and audio streaming, annotation of charts and diagrams, using the drawing tools palette, and hyperlinking to external websites. Comments indicated that while the familiarisation sessions[1]

[1] An optional introductory session was held in advance of each series of seminars.

were valuable, they were insufficient to enable students to develop enough knowledge to use the multimedia capabilities of the environments to their best advantage. Student N stated a lack of multimedia 'know-how' limited her ability to design a creative and engaging seminar, which may have negatively affected her grade. She remarked:

> I couldn't figure out how to link successfully to the outside (external website) so that others could see it! I wanted to use PREZI for my seminar 'cos it has so many neat features . . . you can be much more creative than just Powerpoint. I know you can do it in the classroom, but I couldn't figure it out. I didn't know if it was working properly—I couldn't tell 'cos I could only see my computer. In the end I gave up and just used boring old Powerpoint . . . (Student N, interview transcript, October 2010).

This frustration was also apparent when students used the Wimba Live classroom. One described the environment as 'clunky', claiming that the difficulty of linking beyond the classroom discouraged her from using this capability. She commented:

> The other thing that was really frustrating was the linking, when you provided links. I was chewing up so much energy trying to get it to work in Wimba. It didn't like the fact that I wanted to move away to go to an internet site . . . it was just too hard.
> (Student E, interview transcript, November 2011).

These comments and similar feedback indicated additional work needed to be done to improve student understanding of how different multimedia could be successfully integrated into their seminars.

3. Synchronous communication tool influences

A range of synchronous communication tools is integrated within the virtual classrooms. These enable students to interact and share information through audio, video, text chat, shared 'whiteboard' and drawing tools, and file sharing and polling—as well as provide feedback and indicate questions and opinions using animated emoticons. Of those tools available, students ranked audio, text chat, and video functions most highly (see Table 2). While interview data indicated students valued the visual and audio functions for their community-building role, affordances and limitations were noted regarding their value for effectively communicating information. Many limitations were technical in nature—some linked to the operation of the audio that only allowed for data transmission one way at a time.

Student L likened using the audio to talking on old-fashioned walkie-talkies, but at the same time recognised the difficulty of dealing with live audio and video when several people were involved:

> You felt like you had to say 'over and out' when you had finished speaking . . . just like those old walkie-talkie things! I suppose it has to be that way though, otherwise it could be chaotic with everyone trying to talk over everyone else. I found it annoying to have to hold down the button to talk . . . and sometimes I forgot, and wondered why the others couldn't hear me.
> (Student L, interview transcript, October 2010).

Communicating effectively with the tools relied not only on students knowing how to use them, but also their interpretation of how and when use was appropriate. The data suggest there was some confusion regarding this interpretation, as no guidelines had been established and shared prior to the seminars. It was clear some found the constantly changing text chat distracting, while others mentioned difficulties in maintaining concentration due to the number of simultaneous tool-related activities happening on screen. Three students commented on limitations of the usefulness of the feedback pods, with one stating she gave up indicating questions due to response delays:

> I kept signalling, but nobody took any notice! Maybe they were concentrating on Sam's presentation or something . . . I had a question I wanted to ask her about one of her slides, but by the time she'd finished the moment had passed, so I didn't bother.
> (Student M, interview transcript, October 2010).

These data illustrate typical issues students faced when using the classrooms' communication tools. Some of these issues were technical in nature, while others linked to the absence of guidelines for appropriate use. Implications from these will be raised later in this paper.

4. Technical/logistical influences

Data in this sub-theme were organised into technical (hardware/software/infrastructure) and logistical (organisational) influences on interaction, relationship development and communication. Questionnaire data indicated a small majority of students experienced no technical issues using the classrooms (statement 14, n = 12), although those who did (n = 10) cited hardware quality and network reliability and speed as being the two major concerns (see Table 2). Unsurprisingly, students using wireless networks on low-specification laptops experienced most difficulty, as did those on cabled machines with capped data or different up and download speeds. Data transfer rates on such configurations appeared insufficient to support the level of required activity, resulting in jerky or delayed voice and video delivery. Four students voiced concerns about the effect of issues such as these on their seminars, and felt their performance and possibly their grade had suffered as a result. In one case, the student's internet provider failed to complete necessary speed upgrades in time. She commented:

> if you are going to be assessed on a presentation, and your hardware is clapping out, or if your internet provider is not able to make that more fluid and synchronous, then it does compromise how you feel your presentation will be which will affect your confidence, and the way you are able to get the information out and be assessed on it . . .
> (Student E, interview transcript, November 2011).

Other technical issues included difficulties with camera set-up, but these were predominantly confined to the Connect classroom. Unlike Wimba, the version of Connect used did not have a built-in setup wizard that automatically took care of video and sound settings—students needed to do this manually inside the classroom. Some had difficulties with open applications such as Skype conflicting with Connect's video requirements, while others found their version of Flash Player (needed for video and audio) incompatible or outdated. Others experienced difficulty with Connect recognising their camera, the camera speed being insufficient, or their environment presenting backlight problems that created dark images.

While these issues presented challenges, most students viewed them as 'part and parcel' of working with new technologies, readily accepting that teething issues occur, and that useful learning can come from solving them. As one put it, "when those things do happen, you learn to fix them up yourself—it empowers you a bit more to fix things for yourself, and you know what you're looking for next time". (Student A, interview transcript, November 2011).

Logistically, results from questionnaire statement 13 highlight the number of students who needed to make special arrangements to enable them to participate in the sessions (12/22). This result was a surprise, as the sessions were held on Monday evenings (7.30–9.30 pm approx.) to avoid conflict with other work commitments. Interview data indicated many issues related to technical challenges of the type mentioned earlier, with students choosing to use other people's equipment in preference to their own, due to performance and reliability concerns. Student C illustrated this by commenting, "I went to my cousin's place and he has fast broadband—I was able to use his broadband, because I thought I didn't want to take the risk". (Student C, interview transcript, November 2011). Some overseas students opted to use community facilities such as

public libraries because they had better quality broadband, and four students in rural areas of New Zealand chose to go to their local school for the same reason.

Different time zones presented an additional logistical challenge for international students, with some in Canada and the Middle East needing to work late into the night or early morning to participate. Interestingly, none of them saw this as a major issue for the number of times the classrooms were used, but commented that if more frequent use was required, their thinking might change. As one put it, "as long as we know, we opt in on that basis. We have the choice—it's our responsibility". (Student I, interview transcript, October 2010). Other logistical issues mentioned included the need to organise childcare and sorting other family commitments, so they could participate uninterrupted.

Discussion and implications

Results suggest virtual classrooms can make a valuable contribution to ODL, particularly for learning-community consolidation, offering different options for interaction and communicating knowledge, and developing and/or maintaining supportive relationships between students and teachers. However, results also indicate that maximising the benefits from synchronous environments requires considerable student and tutor preparation and know-how, and that they serve complementary, but fundamentally different purposes, to asynchronous environments. This study holds several implications for those considering using virtual classrooms in higher education.

First, if the intention is to use classrooms for 'high-stakes' or assessment tasks, prior work must be undertaken with students to develop sufficient tool knowledge and understanding of the multimedia capabilities of classrooms to enable them to use these effectively in representing outcomes. This applies particularly to procedures for accessing external websites, streaming audio or video, using functions such as slide annotation, and live sharing of documents. This study is consistent with earlier reports (Falloon, 2011b), in indicating the dangers of assuming students have, or will independently be able to develop, the know-how to use these to their best advantage. It is recommended that dedicated course time be allocated to develop this capability. It is also suggested that tutors need to play an active role here because of how the classrooms work (e.g., 'administrator' rights are needed to enable access to certain tools). While independent student exploration is valuable, there appear to be limitations to the depth of learning that can be generated by this type of activity.

Related to this, the quality of computer hardware and network connectivity undoubtedly affected student interaction and their ability to communicate knowledge in different ways. In using virtual classrooms, there exists potential for some students to be disadvantaged by such factors, some of which may be beyond their control. Teachers must be mindful of this (especially when using classrooms for assessment purposes) and ensure as much as possible that expectations match the technical resources students have access to. There is tension between this stance and fully capitalising on the potential of classrooms to 'push the envelope' in terms of innovative approaches to knowledge communication.

Second, learning experiences seeking student participation through feedback and interaction should be structured accordingly, and guidelines should be established to enable the appropriate use of communication tools. This study revealed the limitations of virtual classrooms for encouraging deeper understanding through critical reflection, such as that advocated by Garrison and Cleveland-Innes (2005). If one objective is for students to engage deeply with material and for the virtual classroom to support this, presentations and structured guidelines for analysis of content should be provided in advance, via asynchronous means. This also applies where there is an expectation of student contribution to and interaction with others' work, through purposeful

discussion and questioning. Like other studies (e.g., Hrastinski, 2008; Wang & Newlin, 2001), this research indicates a clear role for both environments in ODL.

Third, care should be taken to ensure over-use of virtual classrooms does not negatively affect student flexibility and choice, undermining reasons for them opting for ODL. Results suggest something of a 'tipping point' of three to four sessions per 12-week semester course, with a maximum of 1½ hours per session. Beyond this, it is likely that use would be considered intrusive and could detract from student independence. This particularly applies to international students contending with time zones.

Finally, an important consideration for teachers contemplating using virtual classrooms is the effect their use may have on the nature of their work. In this example, classroom sessions were held on Monday evenings to work in with students' other commitments. As many students studying via ODL are studying part time and usually have other employment, it is likely, as in this case, that evenings or weekends are the only suitable times for classroom sessions. Teachers must be prepared to make this commitment, accepting the implications this has for their workload and working hours.

Conclusion

While acknowledging the limited scope of this study, it does indicate a valuable role for virtual classrooms in promoting student interaction and consolidating a sense of identification as members of a learning community. It highlights the need for teachers to invest course time to develop student knowledge of how to best use the multimedia tools available in classrooms, and to carefully design, prepare, and structure classroom activities to encourage deeper, more reflective learning, if that is a goal. Guidelines also need to be established about how and when communication tools should be used, so that their use does not distract other users. Finally, the study suggests teachers need to be mindful of the technology constraints students work within, and while aiming classroom use towards full-utilisation, they must ensure no students are disadvantaged through technology quality or access issues. Further research is needed to determine more accurately the appropriate blends of synchronous and asynchronous system use within ODL courses, so that the specific capabilities of each can best benefit learners without impinging upon their flexibility and choice.

References

Allen, I. E., & Seaman, J. (2004). *Entering the mainstream: The quality and extent of online education in the United States, 2003 and 2004*. Needham, MA: Sloan Consortium. Retrieved from http://www.educause.edu/Resources/EnteringtheMainstreamTheQualit/153420

Anderson, T. D. (2003). Modes of interaction in distance education: Recent developments and research questions. In M. G. Moore and W. G. Anderson (Eds.), *Handbook of Distance Education* (pp. 129–144) Mahwah, NJ: Erlbaum.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101.

Collis, B. (1996). *Tele-learning in a digital world: The future of distance learning*. London: Thompson Computer Press.

Falloon, G. W. (2011a). Making the connection: Moore's theory of transactional distance and its relevance to the use of a virtual classroom in postgraduate online teacher education. *Journal of Research on Technology in Education, 43*(3), 187–209.

Falloon, G. W. (2011b). Exploring the virtual classroom: What students need to know (and teachers should consider). *Journal of Online Learning and Teaching (MERLOT), 7*(4), 439–451.

Garrison, D., & Cleveland-Innes, M. (2005). Facilitating cognitive presence in online learning: Interaction is not enough. *American Journal of Distance Education, 19*(3), 133–148.

Gosmire, D., Van Osdel, J., & Morrison, M. (2009). *Perceptions of synchronous chat tools in an online course*. Paper presented at the National Educational Computing Conference 2009, Washington DC. Retrieved from http://orgs.usd.edu/gpctss/Submissions2009/Gosmire_etal2009.pdf

Gunawardena, C. N., & McIsaac, M. S. (2004). Distance education. In D. Jonassen (Ed.), *Handbook of research on educational communications and technology* (pp. 355–396). Mahwah, NJ: Erlbaum.

Hay, A., Hodgkinson, M., Peltier, J., & Drago, W. (2004). Interaction and virtual learning. *Strategic Change, 13*(4), 193–204. DOI: 10.1002/jsc.679

Haythornthwaite, C. (2002). Building social networks via computer networks: Creating and sustaining distributed learning communities. In K. Renninger & W. Schumar (Eds.), *Building virtual communities: Learning and change in cyberspace* (pp. 159–190). Cambridge: Cambridge University Press.

Hrastinski, S. (2008). Asynchronous and synchronous e-learning: A study of asynchronous and synchronous e-learning methods discovered that each supports different purposes. *EDUCAUSE Quarterly, 31*(4), 51–55.

Kock, N. (2005). Media richness or media naturalness? The evolution of our biological communication apparatus and its influence on our behavior toward e-communication tools. *IEEE Transactions on Professional Communication, 48*(2), 117–130.

Masters, Y., & Gregory, S. (2010). Second Life: Harnessing virtual world technology to enhance student engagement and learning. In R. Muldoon (Ed.), *Rethinking learning in your discipline.* Proceedings of the University Learning and Teaching Futures Colloquium 2010. Armidale, Australia: Teaching and Learning Centre, University of New England.

McInnerney, J., & Roberts, T. (2004). Online learning: Social interaction and the creation of a sense of community. *Educational Technology and Society, 7*(3), 73–81.

Moore, M. (1997). Theory of transactional distance. In D. Keegan (Ed.), *Theoretical principles of distance education* (pp. 22–38). Routledge.

Moore, M., & Kearsley, G. (1996). *Distance education: A systems review*. Belmont: Wadsworth.

Picciano, A. (2002). Beyond student perceptions: Issues of interaction, presence and performance in an online course. *Journal of Asynchronous Learning Networks, 6*(1), 21–40.

Snyder, T., Tan, A., & Hoffman, C. (2006). *Digest of education statistics, 2005*. National Educational Statistics Center, Washington, DC: US Government Printer. Retrieved from http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2006030

Wang, A., & Newlin, M. (2001). Online lectures: Benefits for the virtual classroom. *T.H.E. Journal*. Retrieved from http://www.thejournal.com/articles/15513

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Falloon, G. (2012). Inside the virtual classroom: Student perspectives on affordances and limitation. *Journal of Open, Flexible and Distance Learning, 16*(1), [pp. 108–126].

Appendix A

Starter Interview questions

Thank for being involved, Ice breaker etc.

1. First of all, can you please tell me a little bit about yourself… teaching or other work experience, educational background etc.

2. What are your reasons (motivations) for engaging in learning via online distance mode? (probes: Have you done any other courses or papers in this way? How many? In what areas?).

3. What do you see as the benefits of learning in this way?

4. Are there any issues with, or limitations to ODL, from your perspective?

5. Do you find studying online challenging? Why? (What is it about ODL you find challenging/not challenging?)

6. To date, what has been your experience of ODL?

7. What, in your view, makes a great ODL experience? (probes: course content design, participants' roles, technology mix etc.)

8. What does it take to develop one of these 'great experiences', do you think?

Using virtual synchronous communication tools in ODL

This year in PROF522 we used the Wimba Virtual Classroom and Wimba Voice for an assessed seminar and as an alternative to text for forum discussions, postings etc. In relation to that experience:

9. Do you consider the use of synchronous tools such as the Wimba classroom and Wimba Voice enhanced your ODL experience? (probes: why, why not, how, in what ways?) Detracted from it?

10. Were there any issues, limitations or inconveniences for you attending the virtual classroom seminars?

11. Do you consider using the virtual classroom to present an assignment seminar task was an appropriate use? (probes: why, why not?).

12. As a presenter, were there any factors relating to using the virtual classroom you consider affected your seminar presentation performance? (probes: audience feedback, technical etc.)
13. In listening and looking at others' presentations, were you aware of any factors related to using the virtual classroom that influenced your experience as a member of the audience?

14. Can you identify other ways the virtual classroom might be used in online distance courses? (probes: student directed use? coursework related, tutor-directed use? other uses?)

15. Do you have any comments to make about the use of the audio facility (Wimba Voice) for forums and for other purposes, in this course? (probes: positive and negative points, limitations and affordances etc.)

Thank you for your time and participation in this interview.

Appendix B

Likert/short-response questionnaire statements

1. Please indicate the extent to which you consider using the Wimba (Adobe) classroom was a worthwhile experience in this paper.

2. What effect did the use of the virtual classroom have on your perception of other course members?

3. What effect did the use of the virtual classroom have on your perception of the course tutor?

4. What effect did the use of the virtual classroom have on your perception of being part of a community of learners (belonging)?

5. What effect did the use of the virtual classroom have on your sense of learner isolation?

6. What effect did using the virtual classroom have on your studies?

7. Please indicate your level of support for using the virtual classroom more frequently in courses such as this.

8. Please indicate how frequently you would be prepared to participate in virtual classroom use (for example for tutorials) over a typical 12-14 week course.

9. What is your perception of the virtual classroom as a tool for student collaboration?

10. How easy was it for you to communicate your thoughts and knowledge using the virtual classroom?

11. What affect did using the virtual classroom have on your learning?

12. I had to purchase additional computer equipment to enable me to participate in the virtual classroom?

13. I needed to make special logistical arrangements to enable me to attend the virtual classroom sessions (e.g.: childcare, travel to access a landline, borrow a computer, upgrade my Internet etc.)

14. I had technical issues connecting to the virtual classroom.

15. Please rank your opinion of the technical features of the virtual classroom in order from 1 to 7 (least to most valuable).

16. 16. What is your perception of the adequacy of the performance of the virtual classroom (e.g.: quality of audio, video, speed of content delivery etc.?)

17. Please indicate your Internet connection speed if known.

18. How convenient for you was the timing of the virtual classroom presentations?

19. I consider the maximum duration for a virtual classroom session should be…

20. What affect did the prior distribution of presentation outlines have on your ability to ask questions or otherwise engage with and understand the presentations?

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